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USAAEFA PROJECT NO. 81-01-4

FUEL CONSERVATION EVALUATION OF U.S. ARMY HELICOPTERS, PART 4, OH-58C FLIGHT TESTING

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FINAL REPORT

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MAJ, IN
US ARMY
PROJECT PILOT

AUGUST 1982

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UNITED STATES ARMY AVIATION ENGINEERING FLIGHT ACTIVITY
EDWARDS AIR FORCE BASE, CALIFORNIA 93523

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The United States Army Aviation Engineering Flight Activity conducted level flight performance tests of the OH-58C helicopter at Edwards AFB, California from 22 September to 20 November 1981, and at St. Paul, Minnesota, from 12 January to 9 February 1982. Nondimensional methods were used to identify effects of compressibility and blade stall on performance, and increased referred rotor speeds were used to supplement the range of currently available level flight data. Maximum differences in nondimensional power required

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attributed to compressibility effects varied from 6.5 to 11%. However, high actual rotor speed at a given condition can result in less power required than at low rotor speed even with the compressibility penalty. The power required characteristics determined by these tests can be combined with engine performance to determine the most fuel efficient operating conditions.

DEPARTMENT OF THE ARMY
HQ, US ARMY AVIATION RESEARCH AND DEVELOPMENT COMMAND
4300 GOODFELLOW BOULEVARD, ST. LOUIS, MO 63120

DRDAV-D

SUBJECT: Directorate for Development and Qualification Position on the Final Report of USAAEFA Project No. 81-01-4, Fuel Conservation Evaluation of US Army Helicopter, Part 4, OH-58C Flight Testing

SEE DISTRIBUTION

1. The purpose of this letter is to establish the Directorate for Development and Qualification position on the subject report. The report documents part 4 of a 5 part effort which involves performance flight testing of the OH-58C to obtain performance data and determine the most efficient operating characteristics. Part 1 involved conducting a flight operation improvement analysis. Part 2 was initiated to develop and evaluate flight manual data designed for optimizing fuel conservation. Parts 3, 4, and 5 entail flight testing of the UH-1H, OH-58C, and AH-1S which is specifically oriented towards obtaining performance data applicable to fuel conservation. The part 4 evaluation conducted by the US Army Aviation Engineering Flight Activity (USAAEFA) consisted of obtaining detailed comprehensive performance data for the OH-58C in both hot and cold temperatures. The OH-58C Operator's Manual will be revised at a later date to incorporate the performance data. Additionally, the helicopter performance and engine specification data from this report will be combined and presented in the Operator's Manual in the format determined under Part 2 of the Fuel Conservation Evaluation.

2. This Directorate agrees with the report conclusions and recommendations.

FOR THE COMMANDER:

CHARLES C. CRAWFORD, JR.
Director of Development
and Qualification

TABLE OF CONTENTS

INTRODUCTION

BACKGROUND

1. The US Army is placing emphasis on achieving fuel conservation relative to the operation of Army aircraft. Department of the Army inquiries concerning areas of potential fuel savings led to joint development of a fuel conservation program for helicopters by the US Army Aviation Engineering Flight Activity (USAAEFA) and the Directorate of Development and Qualification, both of which are subordinate elements of the US Army Aviation Research and Development Command (AVRADCOM). This program was approved by the Deputy Chief of Staff for Logistics and the Development and Readiness Command. AVRADCOM then issued a five part test request, one part of which (ref 1, app A) directed USAAEFA to prepare a test plan (ref 2) and conduct a flight evaluation of the OH-58C helicopter.

TEST OBJECTIVES

2. An overall objective of the program was to obtain flight test data to determine the most fuel efficient operating conditions. The specific objective was to supplement currently available level flight performance data for the OH-58 helicopter, to include effects of compressibility and blade stall.

DESCRIPTION

3. The test aircraft, US Army S/N 68-16724, was an OH-58C manufactured by Bell Helicopter Textron (BHT) having a single two-bladed, semirigid, teetering main rotor and a single two-bladed, semirigid, delta-hinged tail rotor. The design (maximum) gross weight of the OH-58C is 3200 pounds. The aircraft is powered by a single Allison T63-A-720 turboshaft engine rated at 420 shaft horsepower (shp) uninstalled at sea level standard day conditions. The main rotor transmission is limited to 270 shp continuous and 317 shp for 5 minutes. Distinctive features of this helicopter include a modified flat plate windscreen, low reflective fuselage paint, passive infrared suppressors mounted on the exhaust stacks, and a tail rotor drive shaft cover. A more detailed description is provided in the operator's manual (ref 3) and in appendix B. The test aircraft also included special test instrumentation, a modified instrument panel, and a test airspeed boom extending forward of the aircraft from the landing light mounting point. The instrumentation recording equipment was installed in the passenger/cargo compartment, and is described in appendix C. An oxygen system was installed in the aircraft

for use by the crew on flights above 10,000 feet pressure altitude (H_P).

TEST SCOPE

4. Level flight performance tests of an OH-58C helicopter were conducted in the vicinity of Edwards Air Force Base, California, from 22 September to 20 November 1981, and in the vicinity of St. Paul, Minnesota, from 12 January to 9 February 1982. Project flying comprised 27 test flights, resulting in 43.4 productive test hours.

5. Flight restrictions and operating limitations contained in the airworthiness release (ref 4, app A) issued by AVRADCOM were observed. For this evaluation, maximum permitted power-on main rotor speed was increased above the handbook limit of 354.4 to 361.5 RPM (100 to 102%). All tests were conducted in a clean configuration (windows and doors closed), at a forward longitudinal center of gravity (cg) location (most adverse condition for performance), slightly right lateral cg, and with engine bleed air OFF. JP-4 fuel was used on all test flights. Sideslip angle was held at zero for all but one data set, which was flown ball centered for comparison.

6. The evaluation consisted of level flight performance tests using referred rotor speed ($N_R/\sqrt{\theta}$) as the major variable to supplement the range of currently available data. General test conditions are shown in table 1. Figure A shows the range of $N_R/\sqrt{\theta}$ and thrust coefficient (C_T) covered by the test matrix flown, and compares it to test conditions from previous USAAEFA programs (refs 5 through 10, app A) at which level flight data are available for OH-58 model aircraft. The previous programs cover a variety of aircraft configurations, and specific differences should be taken into account when comparing test data.

TEST METHODOLOGY

7. Established performance flight test techniques were used (ref 11, app A). Appendix D describes the test techniques and data analysis methods. Test parameters were recorded from calibrated instrumentation by an onboard magnetic tape system installed and maintained by USAAEFA. Aircraft weight and balance measurement, fuel cell calibration, and pitot-static system calibrations were conducted by USAAEFA prior to start of performance testing. An engine torquemeter calibration conducted in an engine test cell was available for the installed engine.

Table 1. Level Flight Performance Test Conditions[1]

Nominal $N_R/\sqrt{\theta}$ ~RPM	Avg $N_R/\sqrt{\theta}$ ~RPM	Avg $C_T \times 10^4$	Avg Gross Wt ~lbs	Avg Press Alt ~ft	Avg Static Air Temp ~°C	App E Fig No.
353	353.2	29.7	2800	1500	15.7	2
	353.2	33.9	2920	3910	14.1	3
	352.4	37.9	3040	5730	12.8	4
	353.6	37.9	2850	7550	5.3	5
	353.2	40.7	3110	7120	9.7	6
	352.8	43.1	3010	9240	8.2	7
	352.7	45.0	3070	9930	7.2	8
359	358.7	30.3	2900	1980	-0.2	9
	359.3	34.3	3020	4250	-1.7	10
	359.4	38.2	3110	6360	-4.6	11
	359.6	41.3	3070	8820	-0.8	12
368	366.8	30.2	3000	2090	-16.8	13
	367.6	30.1	3000	2190	-0.1	14
	367.6	34.2	3110	4500	-8.2	15
	367.9	38.2	2990	8670	-0.8	16
	368.2	38.0	3100	7610	-18.3	17
	368.1	41.2	3010	10400	-18.4	18
374	373.3	30.1	3110	2020	-17.1	19
	373.6	34.2	3030	6150	-8.5	20
	373.1	38.2	3020	9270	-18.0	21
	373.1	41.5	3100	10530	-18.6	22
	373.9	43.0	3010	12340	-24.3	23
	374.5	44.8	3090	12770	-25.3	24
379	378.4	30.2	3000	3830	-17.8	25
	378.6	34.2	3100	6310	-18.8	26
	378.3	38.2	3020	9870	-18.8	27
	378.7	41.2	3100	11150	-20.6	28
	378.1	43.2	3030	12900	-24.6	29
	378.5	45.1	3100	13400	-24.6	30
385	384.7	30.1	3000	4600	-19.4	31
390	389.7	34.2	2970	8900	-27.0	32
	389.9	38.2	3080	10840	-29.7	33
	389.3	41.2	3040	13080	-25.2	34
	389.6	43.2	3100	13720	-27.2	35
Note[2]	346.2	35.6	3110	5470	-15.8	36
	346.6	45.4	3040	13570	-26.7	38
	360.7	31.5	3030	5090	-14.9	37
	361.1	41.2	3110	12800	-27.6	39
349[3]	349.0	38.6	3020	5860	13.0	40
	349.1	38.7	3020	5920	12.6	41

NOTES:

[1] Clean configuration, zero sideslip, forward longitudinal cg, constant thrust coefficient and referred rotor speed method.
[2] Actual rotor speed held constant at values shown
[3] Comparison flights: zero sideslip vs. ball centered

SYM	APP A REF	PROJECT NO. AND TEST	
△	5	68-30	OH-58A A&FC
◇	6	75-11	JOH-58A APE W/Low Refl. Paint and IR Stacks
□	7	76-11-2	OH-58C A&FC
⬭	8	78-12	OH-58C A&FC W/Chaff Dispenser
▽	9	80-15	OH-58C PAE W/Short and 2-Position Skids
◸	10	81-07	OH-58C A&FC W/LCH Configuration
○	This Evaluation		

NOTE: Dashed lines connect pairs of speed-power data sets flown consecutively at limit minimum vs. maximum constant rotor speed.

EACH POINT SHOWN REPRESENTS A COMPLETE SPEED-POWER DATA SET

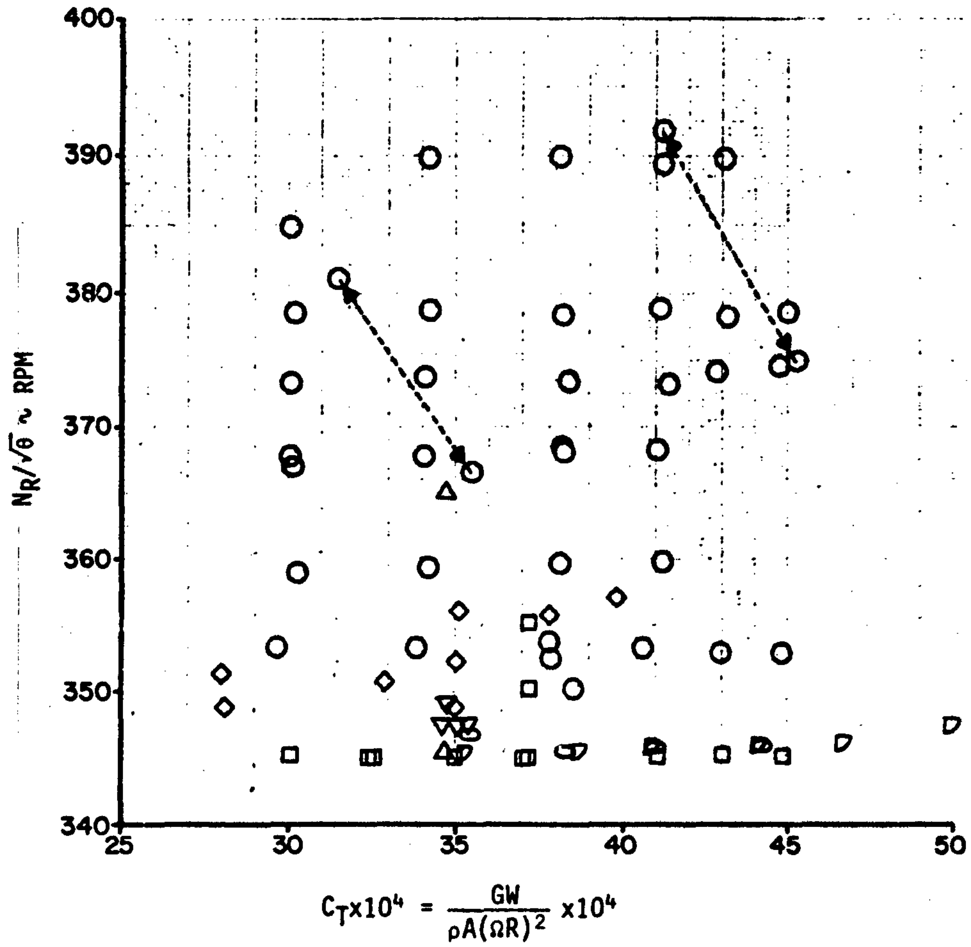


FIGURE A. AVERAGE TEST CONDITIONS,
OH-58 LEVEL FLIGHT PERFORMANCE

RESULTS AND DISCUSSION

GENERAL

8. This evaluation of the OH-58C helicopter obtained level flight performance data to determine power required and fuel flow as a function of airspeed from approximately 35 knots true airspeed (KTAS) to the maximum airspeed for level flight. The constant referred gross weight and rotor speed (W/δ, $N/\sqrt{\theta}$) method was used, and data were obtained at zero sideslip and a forward longitudinal cg location (most adverse for performance). Additional data were obtained in coordinated (ball centered) flight and at constant minimum and maximum actual rotor speed. The power required characteristics determined by these tests can be combined with engine performance to determine the most fuel efficient operating conditions.

POWER REQUIRED

9. The power required for level flight data were analyzed using non-dimensional power, thrust, and speed coefficients (C_P, C_T, and μ), as described in appendix D. The matrix flown, shown in figure A, consisted of 34 sets of speed-power data that covered a range of $C_T \times 10^4$ from 30 to 45, and $N_R/\sqrt{\theta}$ from 353 to 390 RPM. Figure A also shows that previously available OH-58 level flight data are primarily concentrated over a lower range of $N_R/\sqrt{\theta}$, generally between 345 and 355 RPM. The baseline data in this evaluation were flown at a nominal $N_R/\sqrt{\theta}$ of 353 RPM at Edwards AFB. To obtain increased $N_R/\sqrt{\theta}$, the remainder of the data were flown at cold temperatures in Minnesota, and the maximum permitted power-on main rotor speed was raised for test purposes from the handbook limit of 354.4 RPM (100%) to 361.5 RPM (102%). The lower limit of 347 RPM (97%) remained unchanged. The intent of obtaining data at high values of $N_R/\sqrt{\theta}$ was to identify performance trends related to effects of compressibility.

10. A non-dimensional summary of the results is shown in figure 1, app E, and dimensional data for the individual tests are presented in figures 2 through 35. Table 1 provides a cross-reference of test conditions with figure number.

11. For all values of μ, the fairings of C_P versus C_T in figure 1 do not vary with referred rotor speed between $N_R/\sqrt{\theta}$ = 353 through 368 RPM. However, a divergent trend from this baseline appears for the highest $N_R/\sqrt{\theta}$ flown (390 RPM) starting at μ = 0.14. Below this μ, the fairings for all referred rotor speeds are identical to each other, and are the same as those reported in reference 7, appendix A.

As μ increases above 0.14, the fairings for $N_R/\sqrt{\theta} = 390$ form a separate family of curves with higher values of C_P than those of the baseline. Similar trends emerge for other referred rotor speeds with increasing μ: $N_R/\sqrt{\theta} = 379$ separates from the baseline at $\mu = 0.20$, and 374 at $\mu = 0.24$. These effects appear earlier and produce larger C_P increases at higher values of C_T. The difference in C_P attributed to compressibility effects between baseline and high $N_R/\sqrt{\theta}$) acounted to as much as 6.5% at $C_T \times 10^4 = 34$, and 11% at $C_T \times 10^4 = 43$.

ROTOR SPEED

12. The nondimensional summary described above shows a C_P penalty for $N_R/\sqrt{\theta}$ above 368 RPM which is a function of C_T and μ. However, this data must be presented in dimensional quantities to determine whether performance at a fixed gross weight, altitude, temperature, and airspeed could be improved by reducing rotor speed to operate at a lower $N_R/\sqrt{\theta}$. A reduction in rotor speed proportionately reduces $N_R/\sqrt{\theta}$; however, it also increases μ in proportion to RPM and C_T in proportion to RPM^2. Decreasing $N_R/\sqrt{\theta}$ lowers C_P, but the corresponding increase of μ and C_T increases required C_P. Change in performance depends on the relative changes in power and fuel flow.

13. Four sets of data were flown to compare performance at limit rotor speeds (97 and 102%). A speed-power data set was flown at a constant (min or max) rotor speed, immediately followed by a second data set flown at the other RPM limit (max or min). This procedure assured minimum change in ambient conditions over each pair of such data sets. To compensate for fuel burnoff, altitude was varied between points to keep W/σ constant, thus maintaining a single C_T for a given speed-power. Pairs of such data sets at minimum and maximum RPM are shown in figures 36 through 39, appendix E. The first pair (figs. 36 and 37, app E) was flown at approximately -15°C and 5000 ft H_P, and the second pair (figs. 38 and 39, app E) at -27°C and 13,000 ft H_P. Figure A shows the range of C_T and $N_R/\sqrt{\theta}$ covered by these flights, and indicates each data pair by connecting the consecutive speed power conditions with dashed lines. The relative location of these speed-powers on figure A indicates the effect on nondimensional quantities caused by varying rotor speed from minimum to maximum.

14. The nondimensional performance summary of figure 1, appendix E was used to generate the fairings for the four data sets (figs. 36 through 39). Comparison of the fairings for minimum and maximum rotor speed shows that power required is always less

at the maximum rotor speed. The performance difference increases with airspeed, becoming as large as 15 shp for figures 36 and 37, and 30 shp for figures 38 and 39. These data show that higher rotor speeds can result in less power required and better specific range even with compressibility effects at high values of $N_R/\sqrt{\theta}$. The power required increase at higher C_T caused by lower RPM was more significant than the power required decrease from reduced compressibility effects at lower RPM.

SIDESLIP ANGLE

15. While the performance tests were flown at zero sideslip angle for consistency and repeatablity, coordinated (ball centered) flight with the OH-58C requires some left sideslip (aircraft nose yawed right). Two tests were conducted to compare zero sideslip and ball centered performance. Figure 40 shows the inherent sideslip angle for ball centered flight, and corresponding zero sideslip data are shown in figure 41. The effects of sideslip on level flight power required have been previously presented in reference 7, appendix A, which shows the horsepower penalty for 5° left sideslip at 60, 70, 80 and 90 KTAS as 1, 2, 4, and 7 shp, respectively. For the ball centered flight in this evaluation (fig. 40), inherent left sideslip for a typical cruise airspeed of 90 KCAS (100 KTAS) was 2°. Applying data from reference 7, this would correspond to a power required increase of less than 5 shp. The inherent sideslip measured during this test results in a small performance penalty (less than 2%) at cruise. The data from reference 7, appendix A should be used to correct zero sideslip data for handbook presentations.

ENGINE CHARACTERISTICS

16. Fuel flow characteristics of the Allison T63-A-720 engine were derived from a computer program representing the engine specification (ref 12, app A) using installed losses as described in para 10, appendix D. Representative fuel flow characteristics are shown in figure 42, appendix E, covering a pressure altitude range from sea level to 15,000 ft. and temperature from -20 to +20°C. Engine fuel consumption generally improves with both increasing altitude and decreasing temperature. However, the trend with altitude does not remain constant for all conditions. Above 5000 ft. H_P, fuel flow savings with altitude start to decrease for power settings above 210 shp. As power is raised further, eventually a crossover point occurs and the trend is reversed: fuel flow becomes greater than it would be at lower altitude. Fuel efficiency deteriorates rapidly in the vicinity of this crossover point.

17. The engine characteristics presented in figure 42 are based on a power turbine speed of 34,200 RPM (100%). For comparison, fuel flow charcteristics were also derived for 97 and 102%, corresponding to the rotor speed limits. Changes in fuel flow from that shown in figure 42 were negligible over all conditions, generally amounting to a fraction of a pound per hour difference between minimum and maximum RPM. Although such differences are insignificant, the trend showed lower fuel flow with increasing RPM. The largest effects of RPM on fuel flow occurred at high power settings beyond the altitude crossover point. In this region the greatest fuel flow difference seen between minimum and maximum RPM was 4.6 lbs/hr.

FUEL EFFICIENCY

18. Specific range (nautical miles per pound fuel) was calculated for an installed engine for each of the level flight performance tests and is shown in figures 2 through 41. Two values for extracted power loss are shown: 11.09 shp as previously used in reference 7, and 4.05 shp as a more correct value, further described in para 10, appendix D. The trends and curve shapes agree between the engine specification calculations and the measured data, but the specification values are always lower (showing worse performance) than measured. Measured fuel flow data were confirmed on each test flight by correlating the fuel-used value with the calibrated fuel tank sight gage, as described in para 3, appendix D. The remaining specific range difference between the specification and test data is attributed to specification conservatism.

19. Best endurance occurs at minimum fuel flow rate, and best range at maximum nautical miles per pound fuel (specific range). Fuel efficiency for level cruise flight can be maximized at any temperature by flying at the right combination of airspeed, altitude, and rotor speed. This combination can be determined by comparing engine efficiency (fuel flow per horsepower) from the engine specification with aircaft performance (power required) from the summary in figure 1, appendix E. Aircraft performance and engine specification data from this report should be combined and presented in the operator's handbook in the format to be specified in reference 13, appendix A.

20. Figure B shows representative results produced by combining performance data from figure 1, appendix E, with the engine specification. This sample case assumed a mid-gross weight (3050 lbs) and a constant 100% rotor speed. A constant calibrated airspeed of 90 KCAS was selected as a typical cruise condition. Figure B presents the resulting true airspeed, power required,

NOTES: 1. POWER REQUIRED DERIVED FROM FIGURE 1, APP #
2. ENGINE CHARACTERISTICS DERIVED FROM ALLISON SPEC (REF 12) WITH INLET/EXHAUST LOSSES FROM REF 7 AND EXTRACTED POWER LOSS = 4.05 SHP
3. CRUISE CONDITIONS:

CALIBRATED AIRSPEED	=	90 KCAS
GROSS WEIGHT	=	3050 LBS
ROTOR SPEED	=	354.4 RPM (100) PERCENT)

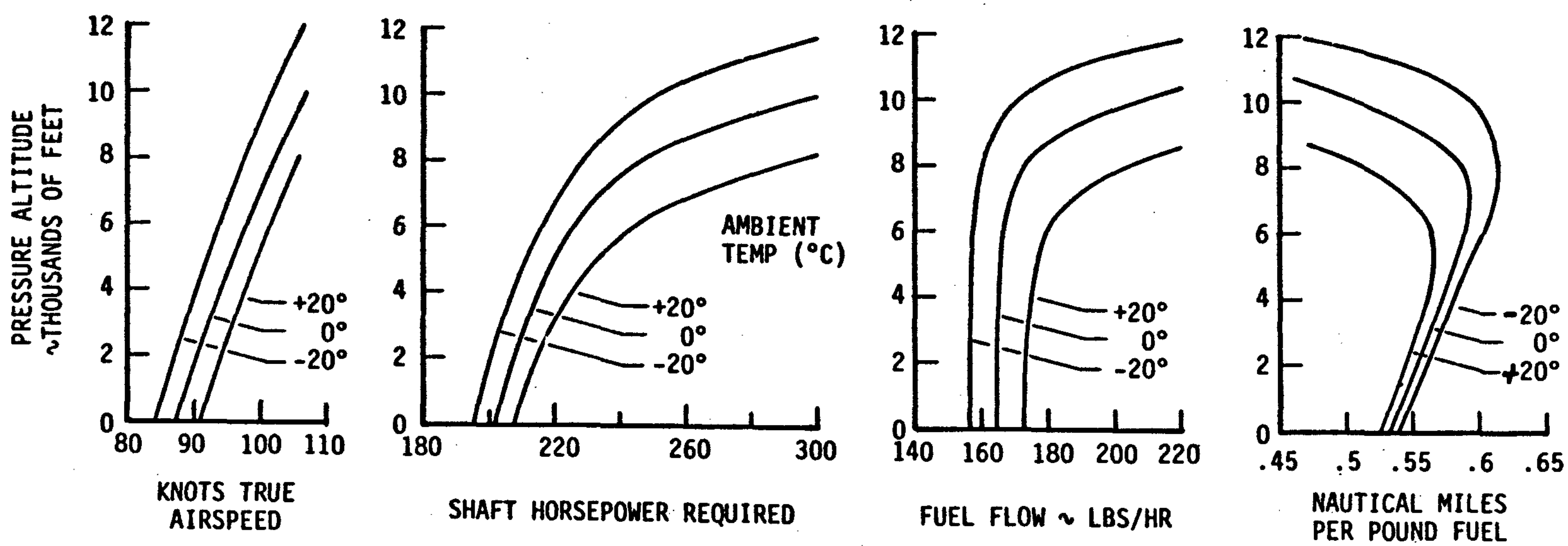


FIGURE B. SAMPLE LEVEL FLIGHT CRUISE PERFORMANCE

fuel flow, and specific range as a function of altitude and temperature. The specific range improves with lower temperature and with higher altitude up to a point. An improvement of nearly 14% occurs for -20°C by flying at the optimum altitude rather than sea level. However, as this altitude is exceeded, an engine performance crossover point (para 16) is reached and specific range deteriorates. For the example shown, specific range would improve regardless of temperature by flying at 6000 ft H_P instead of sea level. Depending on temperature, this improvement could vary from 7-1/2 to 12%.

CONCLUSIONS

21. The power required characteristics determined by these tests can be combined with engine specification performance to determine the most fuel efficient operating conditions. Specific conclusions were:

a. The difference in non-dimensional power required attributed to compressibility effects amounted to as much as 6.5% at a thrust coefficient of .0034, and 11% at .0043 (para 11).

b. Higher rotor speeds can result in less power required and better specific range even with compressibility effects at high values of referred rotor speed (para 14).

c. The inherent sideslip measured during this test results in a small performance penalty (less than 2%) at cruise (para 15).

d. Specific range improves with lower temperature and with higher altitude, up to a point. If the optimum altitude is exceeded, specific range deteriorates rapidly (para 20).

RECOMMENDATIONS

22. The data from reference 7, appendix A, should be used to correct zero sideslip data for handbook presentations.

23. Aircraft performance and engine specification data from this report should be combined and presented in the operator's handbook in the format to be specified in reference 13, appendix A.

APPENDIX A. REFERENCES

1. Letter, AVRADCOM, DRDAV-DI, 20 February 1981, subject: Fuel Conservation Evaluation of US Army Helicopters, Part 4, OH-58C Flight Testing.

2. Letter, USAAEFA, DAVTE-M, 5 October 1981, subject: Test Plan, OH-58C Fuel Conservation Evaluation, USAAEFA Project No. 81-01-4.

3. Technical Manual, TM 55-1520-235-10, *Operator's Manual, Army Model OH-58C Helicopter*, 7 April 1978, with change 16, dated 17 February 1981.

4. Letter, AVRADCOM, DRDAV-D, 8 October 1981, subject: Airworthiness Release for OH-58C Fuel Conservation Evaluation, USAAEFA Project No. 81-01-4.

5. Final Report, USAASTA Project No. 68-30, *Airworthiness and Fight Characteristics Test, Production OH-58A Helicopter, Unarmed and Armed with XM27E1 Weapon System*, September 1970.

6. Final Report, USAAEFA Project No. 75-11, *Army Preliminary Evaluation, JOH-58A Helicopter with Low Reflective Paint and Infrared Countermeasure Exhaust System*, December 1975.

7. Final Report, USAAEFA Project No. 76-11-2, *Airworthiness and Flight Characteristics Evaluation, OH-58C Interim Scout Helicopter*, April 1979.

8. Letter, USAAEFA, DAVTE-TI, 21 February 1981, subject: Letter Report, Airworthiness and Flight Characteristics Test of OH-58C with XM-130 Chaff Dispenser System, USAAEFA Project No. 78-12.

9. Letter, USAAEFA, DAVTE-TI , 20 July 1981, subject: Report, Preliminary Airworthiness Evaluation of the OH-58C Helicopter with Fixed Short Landing Gear and with Two Position Landing Gear, USAAEFA Project No. 80-15.

10. Final Report, USAAEFA Project No. 81-07, *Airworthiness and Flight Characteristics of an OH-58C Configured to a Light Combat Helicopter (LCH)*, October 1981.

11. Engineering Design Handbook, Army Material Command, AMCP-706-204, *Helciopter Performance Testing*, August 1974.

12. Model Specification, Detroit Diesel Allison Division of General Motors Corporation, No. 876, *Military Turboshaft Engine, Model T63-A-720*, 12 September 1975.

13. Final Report, USAAEFA Project No. 81-01-2, *Development and Evaluation of Fuel Conservation Formatted Data,* to be published.

14. Detail Specification, Bell Helicopter Company, No. 206-947-203, *Detailed Specification for the OH-58C Helicopter Interim Scout,* 19 September 1975, with revision R-2, 1 March 1977.

APPENDIX B. AIRCRAFT DESCRIPTION

1. A general description of the standard OH-58C helicopter including operating procedures and limitations is presented in the operator's manual (ref 3, app A). Photographs 1 through 3 show the test aircraft. For this evaluation, the aircraft was equipped with a modified flat plate windscreen, low reflective fuselage paint, passive infrared suppressors mounted on the exhaust stacks, and a tail rotor drive shaft cover. As part of instrumentation, a test airspeed boom extended forward of the aircraft from the landing light mounting point. A description of the powerplant and some general aircraft characteristics are given below.

POWERPLANT

2. Aircraft power is provided by a T63-A-720 turboshaft engine of the free turbine type built by the Allison division of Detroit Diesel Corporation. The gas producer is composed of a combination six-stage axial, single-stage centrifugal flow compressor directly coupled to a two-stage compressor turbine. The power turbine is a two-stage free turbine that is gas coupled to the gas producer turbine. The integral reduction gearbox provides an internal spline output drive at the front of the gearbox. The engine has a single combustion chamber. The output shaft center line is located below the center line of the engine rotor and the exhaust is directed upward.

3. This engine has an uninstalled sea-level standard day intermediate rating of 420 shp and a maximum continuous rating of 370 shp. As installed in the OH-58C, the engine is limited by either the output shaft torque (transmission limit), gas producer turbine outlet temperature, or gas producer speed. For maximum continuous operation, these limits are, respectively, 229.5 ft-lb torque (270 shp) at 6180 output shaft RPM, 738°C, or 105%, whichever is reached first. The respective time-dependent limits are 269.4 ft-lb (317 shp) for 5 minutes, 810°C for 30 minutes, or 106% for 15 seconds.

DIMENSIONS AND DESIGN DATA

Overall Dimensions

Aircraft length (nose to tail skeg)	32 ft, 2.0 in.
Width (skid to skid)	6 ft, 5.4 in.
Height (over main rotor blades at rest)	9 ft, 7.0 in.
Height (top of vertical stabilizer)	8 ft, 1.5 in.

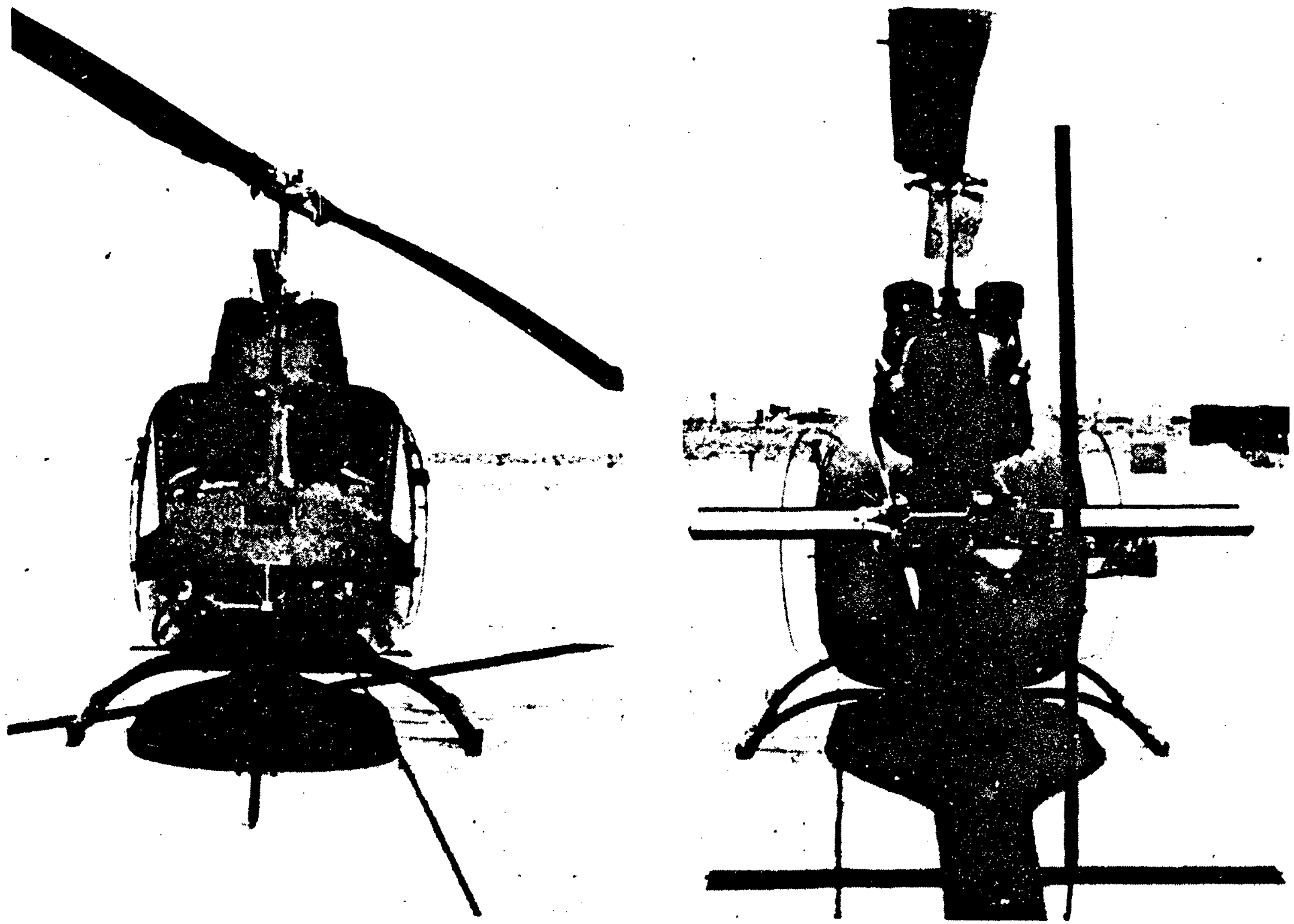


Photo 1. Front and rear view, OH-58C Helicopter

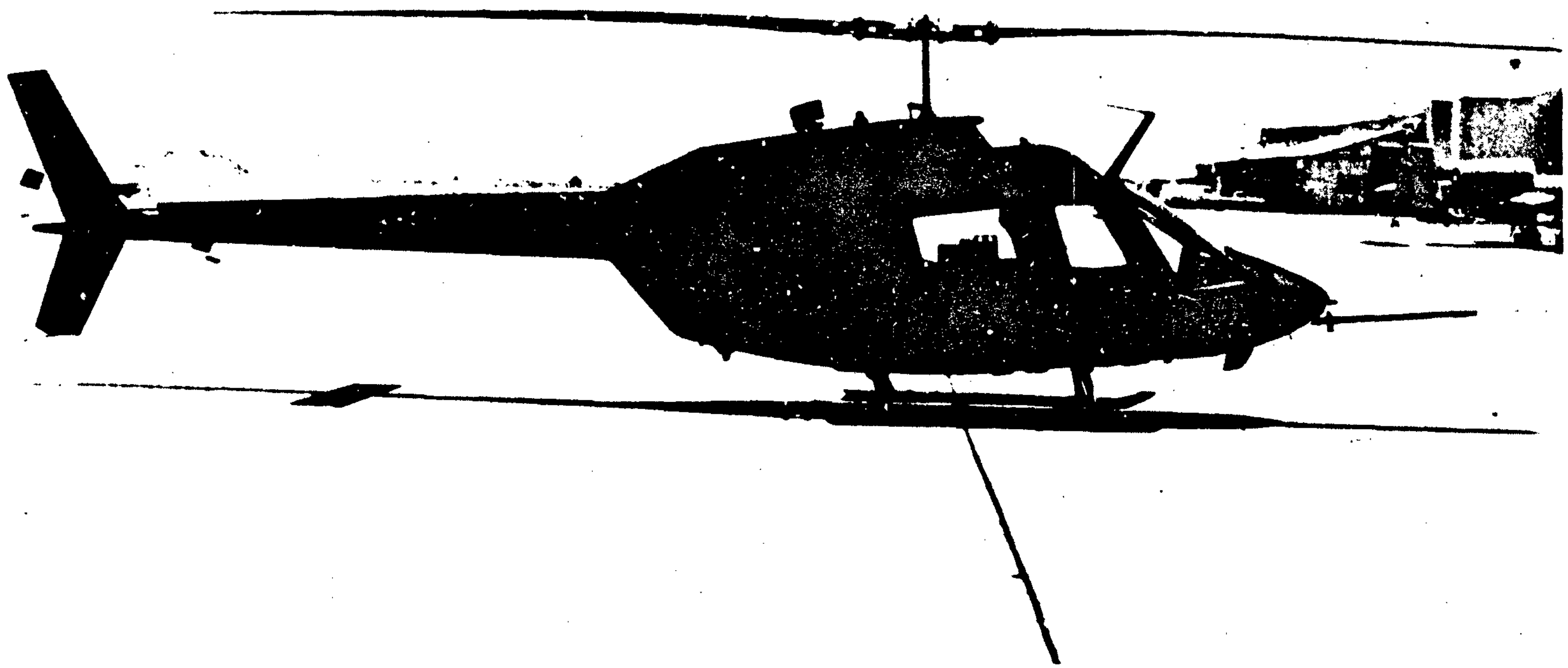


Photo 2. Side view, OH-58C Helicopter

Photo 3. Front quartering view, OH-58C Helicopter

Main Rotor

Number of blades	2
Diameter	35 ft, 4 in.
Blade chord (constant)	1.08 ft
Solidity	0.0390
Blade twist angle	-10.6 deg linear
Hub precone angle	3.0 deg
Airfoil section thickness	11.3%
Airfoil type	Modified "droop-snoot" airfoil

Tail Rotor

Number of blades	2
Diameter	5 ft, 2 in.
Blade chord	0.4375 ft
Blade twist angle	0 deg
Hub precone angle	0 deg
Airfoil section designation and thickness (constant)	NACA 0012.5

Horizontal Stabilizer (non-moveable)

Area	9.65 sq ft
Span	6 ft, 5.2 in.
Chord	1 ft, 6.0 in.
Airfoil section designation and thickness	Bell Design Section
Incidence, normal	0 deg

Vertical Stabilizer

Area	10.2 sq ft
Span	6 ft, 5.7 in.
Chord, average	1 ft, 4.9 in.
Airfoil section	Bell Design Section
Sweep of leading edge	
Upper	25 deg aft
Lower	32.5 deg aft

Gear Ratio (see Note 1)

Engine power turbine to output shaft (Allison T63-A-720)	5.534:1
Engine output shaft to main rotor drive	17.44:1
Engine output shaft to tail rotor drive	2.353:1

Operating Limitations (see Note 2)

Power Turbine Speed	98 to 100% continuous 110% 15 sec transient
Gas Producer Tachometer	105% continuous 106% 15 sec transient
Turbine Outlet Temperature (TOT)	738°C continuous 810°C 30 minutes 843°C 6 sec transient
Rotor Speed (Power on)	98 to 100%
Rotor Speed (Power off)	93 to 110%
Airspeed (V_{NE})	120 kts at and below 3000 ft density altitude, decreasing with altitude by 3 KCAS per 1000 ft

NOTES:

1. 100% Engine Ouput Shaft Power Turbine/Rotor Tach = 6180 RPM Engine Output Shaft/34200 RPM Power Turbine/354.4 RPM Main Rotor
2. Maximum continuous Engine/Rotor limit raised to 102% for this evaluation

Longitudinal Center of Gravity (fuselage station):

Aircraft weight (lbs)	Forward	Aft
2500 and less	105.2	114.2
3000	106.0	112.2
3200 (maximum)	107.0	111.4

Transmission Torque (at 100% rotor speed): 85% ~ 270 shp continuous
100% ~ 317 shp 5 minutes

APPENDIX C. INSTRUMENTATION

1. The test instrumentation system was designed, calibrated, installed, and maintained by USAAEFA. Digital and analog data were obtained from calibrated instrumentation and were recorded on magnetic tape and/or displayed in the cockpit. The instrumentation system consisted of various transducers, signal conditioning units, an eight-bit pulse code modulated (PCM) encoder, and the Ampex AR 700 tape recorder. Time correlation was accomplished with a run counter and onboard recorded and displayed Inter-Range Instrumentation Group (IRIG) B time. Various specialized test indicators displayed data to the pilot and engineer continuously during the flight. A boom with swiveling pitot-static head, sideslip vane, and angle-of-attack vane sensors extended 71 inches from the nose of the aircraft. The boom airspeed system calibration is shown in figure 1. The engine torquemeter calibration is shown in figure 2.

2. The calibrated instrumentation, equipment, and recorded data included the following:

<u>Copilot Station</u>

Instrumentation controls
  and displays
Event switch

<u>Displayed on Instrument Panel</u>

Airspeed (boom and ship's system)
Altitude (boom)
Angle of sideslip
Free air temperature
Rotor speed
Engine torque pressure
Gas generator speed
Measured gas temperature
Fuel used
Run number
Time

<u>Recorded on Tape</u>

Airspeed (boom system)
Altitude (boom system)
Angle of sideslip
Angle of attack
Total air temperature
Control positions
  Longitudinal
  Lateral
  Directional
  Collective
Rotor speed
Engine torque pressure
Gas generator speed
Turbine outlet temperature
Fuel flow rate
Fuel used
Pitch attitude
Roll attitude
Yaw attitude
Center-of-gravity acceleration
  Vertical
  Longitudinal
  Lateral
Copilot's event
Run Number
Time

FIGURE 1
BOOM SYSTEM AIRSPEED CALIBRATION IN LEVEL FLIGHT
OH-58C USA S/N 68-16724

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG DENSITY ALTITUDE (FT)	AVG TA (°C)	AVG ROTOR SPEED (RPM)
3100	108.5(MID)	0.8(RT)	4500	10.5	352.7

NOTE: TRAILING BOMB METHOD

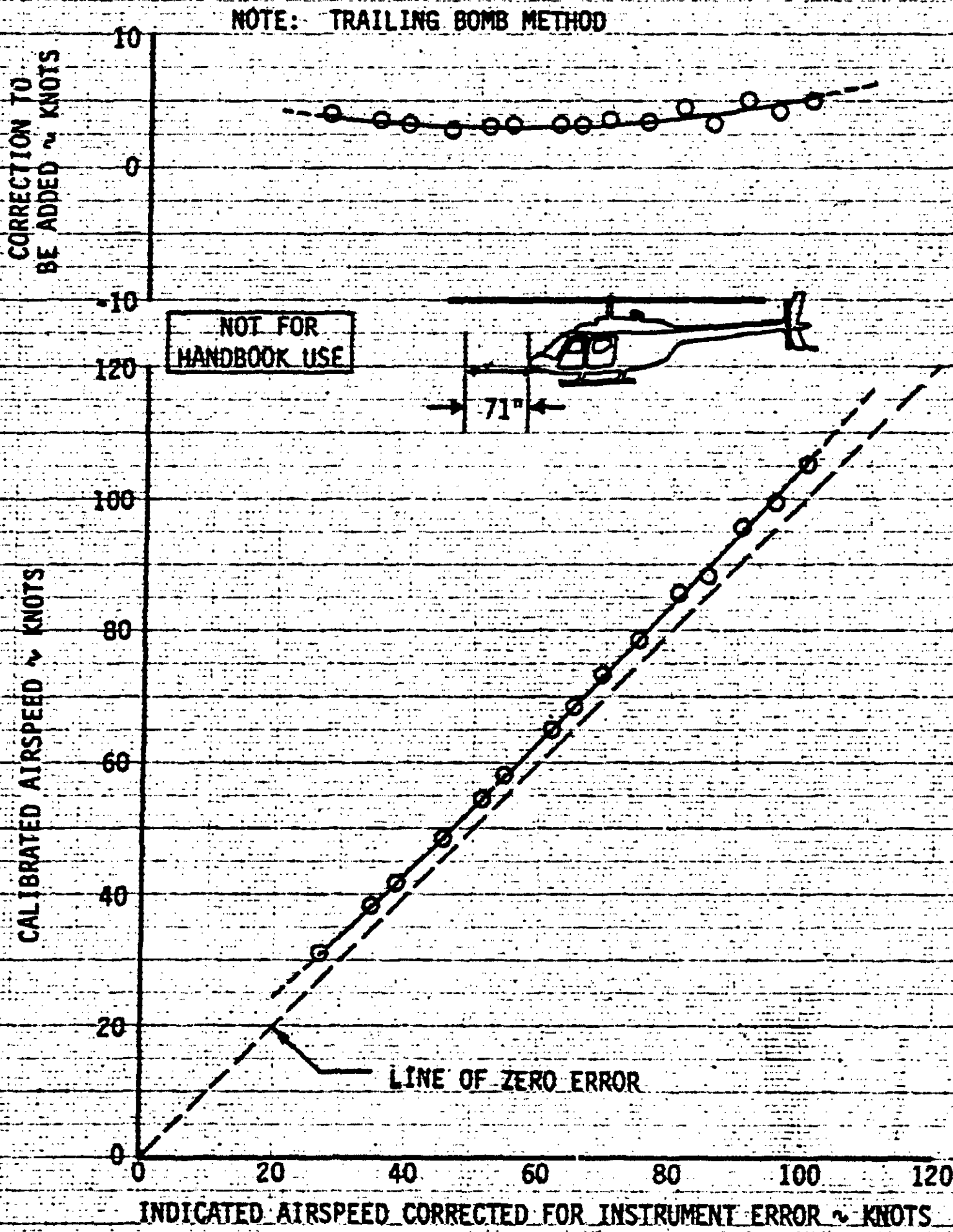
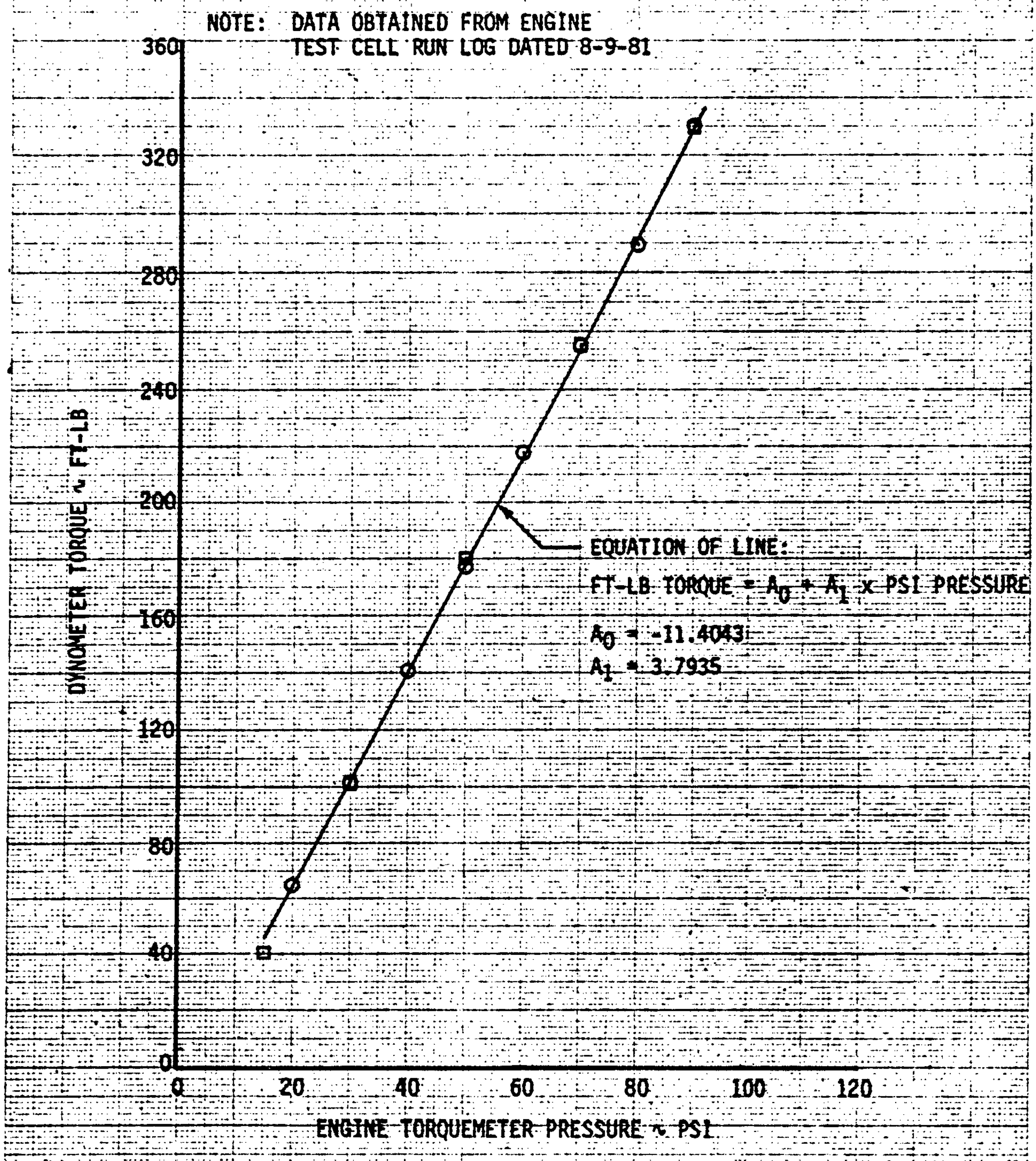


FIGURE 2
ENGINE TORQUEMETER CALIBRATION
ALLISON ENGINE MODEL T63-A-720 S/N 404961
FUEL TYPE: COMMA 50 FUEL LOWER HEATING VALUE = 18488 BTU/LB

SYMBOL POWER TURBINE SPEED
O 34280 RPM
□ 33280 RPM
AVERAGE COMPRESSOR INLET TEMPERATURE: 79°F



APPENDIX D. TEST TECHNIQUES AND DATA ANALYSIS METHODS

General

1. Conventional level flight performance test techniques were used to conduct this evaluation (ref 11, app A). Speed-power data were obtained in increasing increments of airspeed from 30 KIAS until reaching an operating limitation (either V_{NE}, transmission torque, TOT, or gas producer speed, as described in app B), followed by (staggered) decreasing airspeed increments to 30 KIAS. Specific points would be repeated as judged appropriate by using an onboard plot of indicated torque versus airspeed for each point taken. All tests were conducted under nonturbulent atmospheric conditions to preclude uncontrolled disturbances influencing the results. Data were be recorded on magnetic tape once a stable condition was achieved, and each point used was held for approximately 30 seconds. Test data presented have not been corrected for any drag differences caused by the test airspeed boom. It is assumed such differences would fall within the data scatter, and previous attempts to define boom drag have been hampered by loss of sideslip reference.

Weight and Balance

2. Prior to testing, the aircraft gross weight and center-of-gravity location were determined with calibrated scales (electrical load cells placed under the aircraft jack points). The aircraft was weighed in the configurations flown with instrumentation installed. The empty gross weight including full oil and trapped fuel was determined to be 2185 pounds with a longitudinal center-of-gravity at fuselage station (FS) 114.5 inches and lateral center-of-gravity at 1.2 inches right for the Edwards AFB, CA, flights; and 216 pounds, FS 114.0, and 1.0 inches right for the St. Paul, MN, flights.

3. A manometer-type external sight gauge was calibrated and used to determine fuel volume. Fuel specific gravity was measured with a hydrometer. The fuel loading for each test flight was determined both prior to engine start and following engine shutdown. Fuel used in flight was recorded by a test fuel-used system and verified with the pre- and post flight sight gauge reading. Fuel cg versus fuel volume contained in the fuel cell (70 gallon capacity) had been previously determined, and this calibration was used to calculate aircraft cg for each test point. Aircraft gross weight and cg were also controlled by ballast installed at various locations in the aircraft. All tests were flown at a forward longitudinal cg location (most adverse condition for performance).

Level Flight Performance and Specific Range

4. The helicopter level flight performance data were generalized by the following nondimensional coefficients:

a. Coefficient of power (C_P):

$$C_P = \frac{SHP\ (550)}{\rho\ A(\Omega R)^3} \qquad (1)$$

b. Coefficient of thrust (C_T):

$$C_T = \frac{W/\delta}{\rho_o A(\Omega R/\sqrt{\theta})^2} = \frac{W}{\rho A(\Omega R)^2} \qquad (2)$$

c. Advance ratio (μ):

$$\mu = \frac{1.6878\ V_T}{\Omega R} \qquad (3)$$

d. Advancing blade tip Mach number (M_{tip}):

$$M_{tip} = \frac{1.6878\ V_T + (\Omega R)}{a} = \frac{R}{a_o}\ \frac{\Omega}{\sqrt{\theta}}\ 1+\mu \qquad (4)$$

Where:

SHP = Engine output shaft horsepower
550 = Conversion factor (ft-lb/sec/shp)
ρ = Air density (slug/ft^3)
ρ_o = Standard day sea level density (.0023769 slugs/ft^3)
δ = Ambient pressure ratio (test point to sea level standard)
A = Main rotor disc area (ft^2) = 980.56
Ω = Main rotor angular velocity (radian/sec) = $\frac{2\pi}{60}$ x RPM
R = Main rotor radius (ft) = 17.667
W = Gross weight (lb)
θ = (T + 273.15)/288.15
T = Ambient air temperature (°C)
1.6878 = Conversion factor (ft/sec/knot)
V_T = True airspeed (knot)
a = Speed of sound (ft/sec) = 1116.45 $\sqrt{\theta}$
a_o = Speed of sound at seal level standard (ft/sec) = 1116.45

With rotor speed measured in RPM, the following constants were used:

$$\Omega R = 1.850053 \times RPM \text{ (ft/sec)}$$
$$A(\Omega R)^2 = 3356.053 \times RPM^2 \text{ (ft}^4\text{/sec}^2\text{)}$$
$$A(\Omega R)^3 = 6208.877 \times RPM^3 \text{ (ft}^5\text{/sec}^3\text{)}$$

5. Each speed power was flown at a predetermined constant C_T by maintaining a constant referred gross weight (W/δ) and referred rotor speed ($N/\sqrt{\theta}$). A constant W/δ was maintained by increasing altitude between data points to decrease ambient pressure ratio (δ) as aircraft gross weight decreased due to fuel burnoff. Rotor speed was also varied to maintain a constant $N/\sqrt{\theta}$ as the ambient air temperature varied.

6. Standard iterative carpet and cross-plotting were applied to each set of data to provide smooth fairings in non-dimensional format and develop consistent families of curves continuous with each dimension (C_P, C_T, and μ). Sets of data for each $N_R \sqrt{\theta}$ were independently processed in this way, followed by comparison with each other to identify trends with referred rotor speed. Final adjustments to the fairings were made using combined data to arrive at a family of nondimensional curves (fig. 1, app E) that summarize the entire matrix of test results and include effects of each parameter varied.

7. Test-day (measured) level flight power was corrected to average flight conditions for each set of speed-power data by assuming the test-day dimensionless parameters C_{P_t}, C_{T_t}, and μ_t are identical to $C_{P_{avg}}$, $C_{T_{avg}}$, and μ_{avg}, respectively.

From equation 1, the following relationship can be derived:

$$SHP_{avg} = SHP_t \left(\frac{\rho_{avg}}{\rho t} \right) \qquad (5)$$

Where:

Subscript t = test day (measured for each data point)
Subscript avg = average over each set of speed power data

8. Test specific range was calculated using level flight performance data and the measured fuel flow.

$$SR = \frac{V_T}{W_f} \qquad (6)$$

Where:

SR = Specific range (nautical air miles per pound of fuel)
V_T = True airspeed (knot)
W_f = Fuel flow (lb/hr)

Shaft Horsepower Required

9. The engine output shaft torque was determined from the engine manufacturer's torque system. The relationship of measured torque pressure (psi) to engine output shaft torque (ft-lb) was determined from the engine test cell calibration is shown in figure 2, appendix C. The output shp was determined from the engine output shaft torque and rotational speed by equation (7).

$$SHP = \frac{2\pi \times N_P \times Q}{33{,}000} \quad (7)$$

Where :

N_P = Engine output shaft rotational speed (rpm)
Q = Engine output shaft torque (ft-lb)
33,000 = Conversion factor (ft-lb/min/shp)

Specification Fuel Flow and Shaft Horsepower

10. Specification fuel flow and shaft horsepower were obtained from Allison Engine Model Specification computer program, US Army Model T63-A-720, Model Spec 876, dated 12 September 1975 (ref 12, app A). All computations were made for a bleed air OFF condition. Installed engine characteristics are described in reference 7 (Project 76-11-2), which combines inlet losses from ref 5 (Project 68-30), exhaust losses from ref 6 (Project 75-11), and extracted shp losses as a constant 11.09 shp. This value is excessive and contains some accessory losses which should not be included in engine power available. A more correct value of extracted shp as given in the OH-58C detail specifiction (ref 14, app A) is 4.05 shp, representing power extracted from the engine gas generator for an 80 ampere starter-generator load (28 volt system). Actual electrical load on the test aircraft as flown was approximately 32 amps, of which 10 amps were drawn by the test instrumentation and tape recorder, and 10 amps by the rotating beacon. Use of bleed air and heater increased electrical load by 2 amps. For comparison, both values of extracted power (11.09 and 4.05 shp) were used to calculate specific range, as shown in figures 2 through 41, appendix E.

Indicated Airspeed and Pressure Altitude

11. Airspeed, static pressure, and total temperature were measured from sensors mounted on a flight test boom installed on the nose of the aircraft. The output signals were recorded on magnetic tape, and the following expressions were used to calculate the parameters:

a. Indicated airspeed corrected for instrument error (V_{ic}):

$$V_{ic} = a_o \left\{ 5 \left[\left(\frac{qc_{ic}}{Pa_o} + 1 \right)^{2/7} -1 \right] \right\}^{1/2} \qquad (8)$$

b. Indicated pressure altitude corrected for instrument error (HP_{ic}):

$$HP_{ic} = \left[1- \left(\frac{Pa_{ic}}{P_a} \right)^{1/5.255863} \right] / 6.8755856E-06 \qquad (9)$$

Where:

V_{ic} = Indicated airspeed corrected for instrument error (kt)
a_o = Speed of sound at standard day, sea level = 661.479 kt
qc_{ic} = Indicated differential pressure corrected for instrument error (in. Hg)
Pa_o = Atmospheric pressure at standard day, sea level = 29.92125 in. HG
HP_{ic} = Indicated pressure altitude corrected for instrument error (ft)
(Pa_{ic}) = Indicated pressure altitude corrected for instrument error (in. Hg)

Airspeed Calibration

12. The boom pitot-static system was calibrated using the trailing bomb method to determine the airspeed position error. This calibration is shown in fig. 1, app C. Calibrated airspeed (V_{cal}) was obtained by correcting indicated airspeed (V_i) using instrument (ΔV_{ic}) and position (ΔV_{pc}) error corrections.

$$V_{cal} = V_i + \Delta V_{ic} + \Delta V_{pc} \qquad (10)$$

13. True airspeed (V_t) was calculated from the calibrated airspeed and density ratio.

$$V_t = \frac{V_{cal}}{\sqrt{\sigma}} \qquad (11)$$

Where:

σ = Density ratio $\left(\frac{\rho}{\rho_o}\right)$

Corrected Pressure Altitude and Altitude Position Error

14. HP_{ic} was corrected for altimeter position error by using ΔV_{pc}. The assumption was made that a pressure position error (ΔP_p) was produced entirely at the static source. Since both airspeed and altitude systems utilize the same static source, the following relationships were used:

$$qc = \left\{\left[.2 \left(\frac{V_{cal}}{a_o}\right)^2 + 1\right]^{3.5} - 1\right\} Pa_o \quad (12)$$

$$\Delta P_p = qc - qc_{ic} \quad (13)$$

$$Pa = Pa_{ic} - \Delta P_p \quad (14)$$

$$Hp = \left[1.0 - \left(\frac{Pa}{Pa_o}\right)^{1/5.255863}\right] / 6.8755856E\text{-}06 \quad (15)$$

Where:

qc = Differential pressure corrected for position and instrument error (in. Hg)

qc_{ic} = Indicated differential pressure corrected for instrument error (in. Hg)

V_{cal} = Calibrated airspeed (knots)

a_o = Speed of sound at standard day sea level = 661.479 knots

Pa_o = Atmospheric pressure at standard day, sea level = 29.92125 in. Hg

ΔP_p = Pressure position error (in. Hg)

Pa = Atmospheric pressure at corrected altitude (in. Hg)

Pa_{ic} = Indicated pressure altitude corrected for instrument error (in. Hg)

Hp = Corrected pressure altitude (ft)

Static Temperature

15. Static temperature was obtained by correcting the measured total temperature for temperature rise due to compressibility. The following assumptions were made:

a. The temperature probe recovery factor is equal to 1.

b. The equivalent airspeed is equal to calibrated airspeed.

The following expressions were used:

$$T_{Tic} = OAT_{ic} + 273.15 \tag{16}$$

$$Ta = \frac{T_{Tic}}{\left(\frac{qc}{pa + 1}\right)^{2/7}} \tag{17}$$

$$OAT = Ta - 273.15 \tag{18}$$

Where:

OAT_{ic} = Indicated ambient temperature corrected for instrument error (C°)

T_{Tic} = Indicated temperature corrected for instrument error (K°)

Ta = Static temperature (K°)

P_a = Atmospheric pressure at corrected altitude (in. Hg)

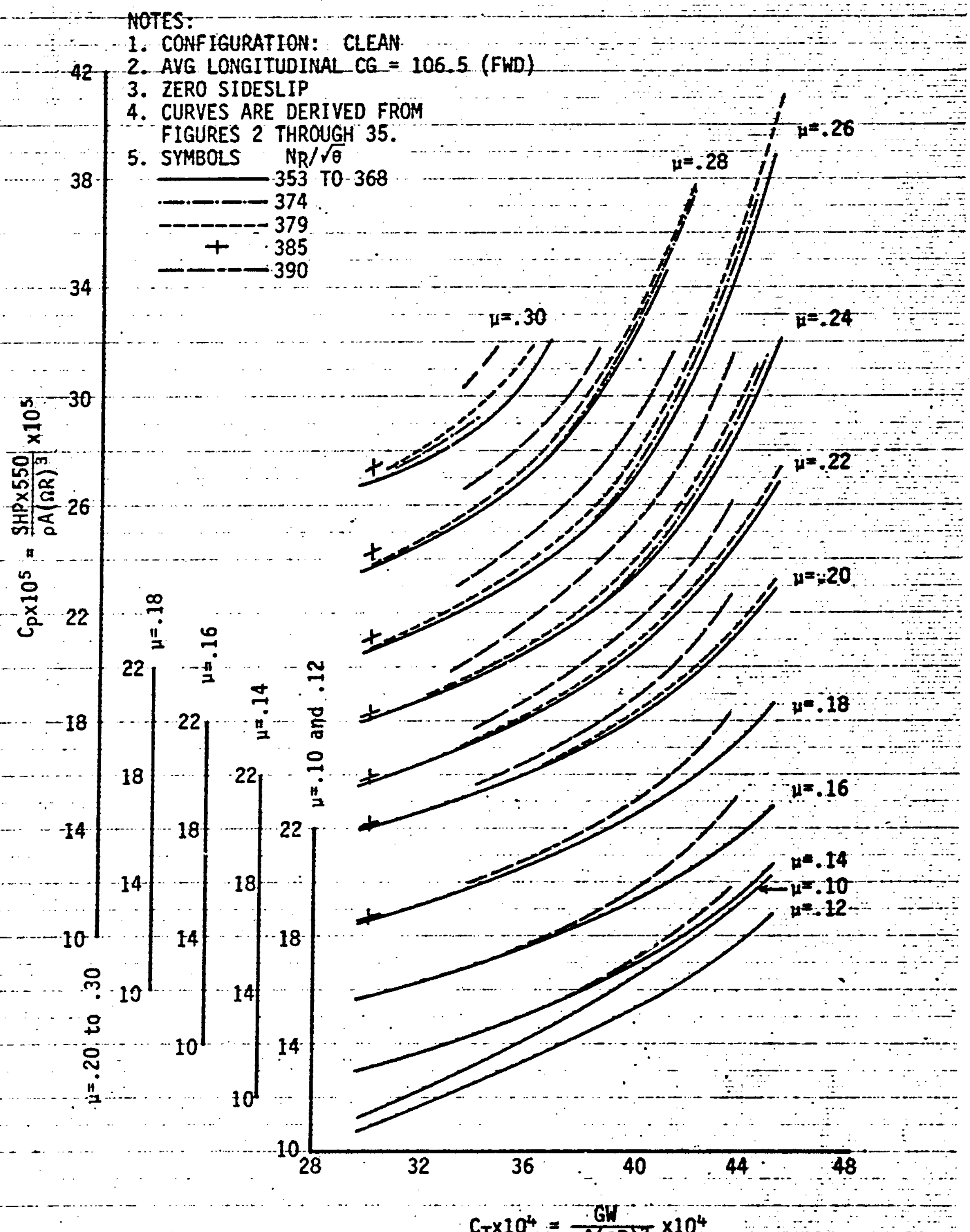
qc = Differential pressure corrected for position and instrument error (in. Hg)

ρ_o = Air density at standard-day sea-level (.0023769 slugs/ft^3)

OAT = Static temperature (C°)

APPENDIX E. TEST DATA

FIGURE 1
NONDIMENSIONAL LEVEL FLIGHT PERFORMANCE
OH-58C USA S/N 68-16724



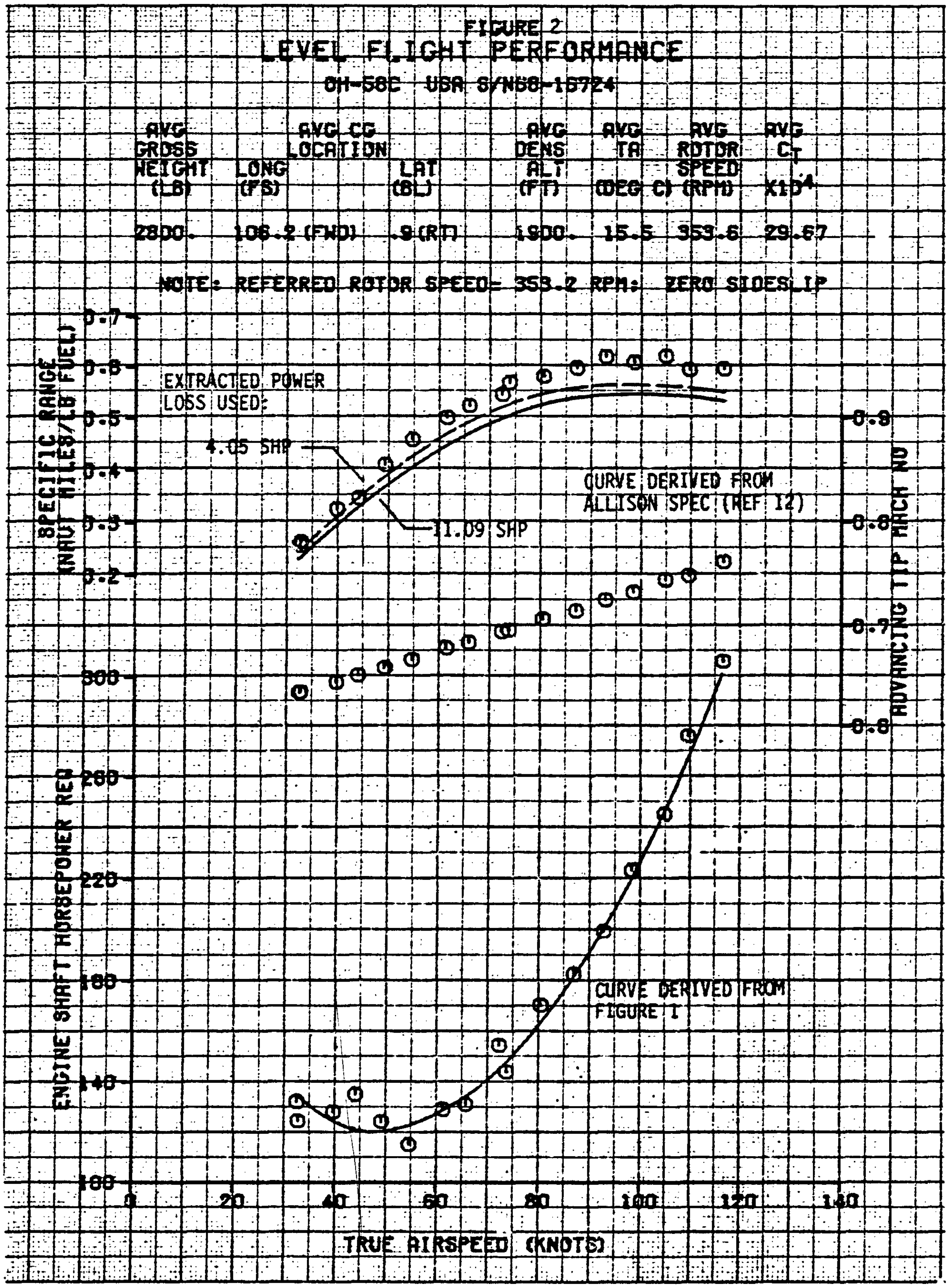


FIGURE 2
LEVEL FLIGHT PERFORMANCE
OH-58C USA S/N68-16724
AVG GROSS WEIGHT (LB)
AVG CG LOCATION
LONG (FS)
LAT (BL)
AVG DENS ALT (FT)
AVG TA (DEG C)
AVG ROTOR SPEED (RPM)
AVG C_T X10^4
2800.
106.2 (FWD)
.9 (RT)
1900.
15.5
353.6
29.67
NOTE: REFERRED ROTOR SPEED= 353.2 RPM: ZERO SIDESLIP
SPECIFIC RANGE (NAUT MILES/LB FUEL)
EXTRACTED POWER LOSS USED:
4.05 SHP
11.09 SHP
CURVE DERIVED FROM ALLISON SPEC (REF 12)
ADVANCING TIP MACH NO
ENGINE SHAFT HORSEPOWER REQ
CURVE DERIVED FROM FIGURE I
TRUE AIRSPEED (KNOTS)

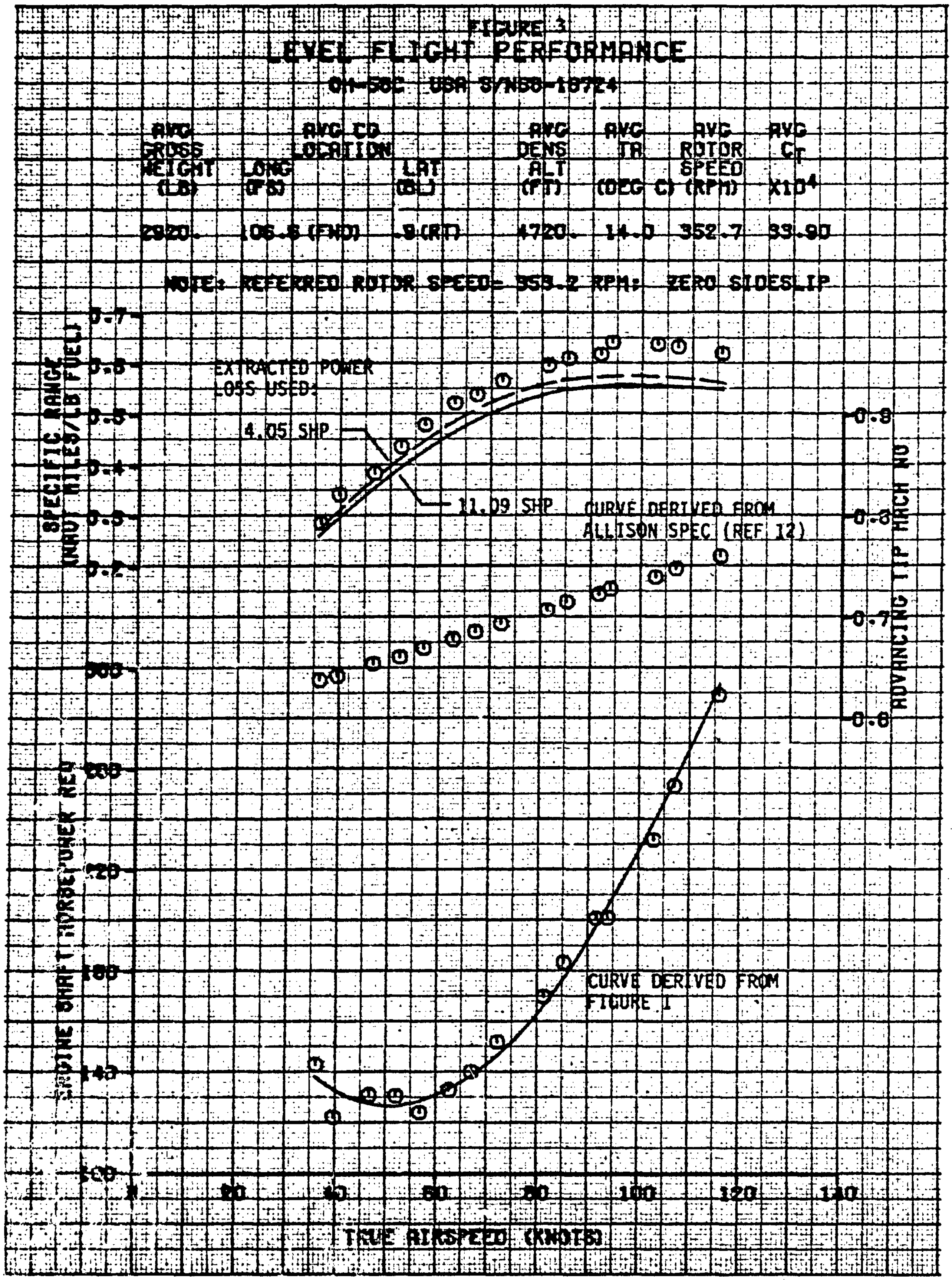


FIGURE 3
LEVEL FLIGHT PERFORMANCE
AVG GROSS WEIGHT (LB)
AVG CG LOCATION
LONG (FS)
LAT (BL)
AVG DENS ALT (FT)
AVG TR (DEG C)
AVG ROTOR SPEED (RPM)
AVG C_T X10[4]
2920.
106.6 (FWD)
.9 (RT)
4720.
14.0
352.7
33.90
NOTE: REFERRED ROTOR SPEED= 353.2 RPM; ZERO SIDESLIP
SPECIFIC RANGE (NAUT MILES/LB FUEL)
0.7
0.6
0.5
0.4
0.3
0.2
EXTRACTED POWER LOSS USED:
4.05 SHP
11.09 SHP
CURVE DERIVED FROM ALLISON SPEC (REF 12)
ADVANCING TIP MACH NO
0.9
0.8
0.7
0.6
ENGINE SHAFT HORSEPOWER REQ
300
260
220
180
140
100
CURVE DERIVED FROM FIGURE 1
0
20
40
60
80
100
120
140
TRUE AIRSPEED (KNOTS)

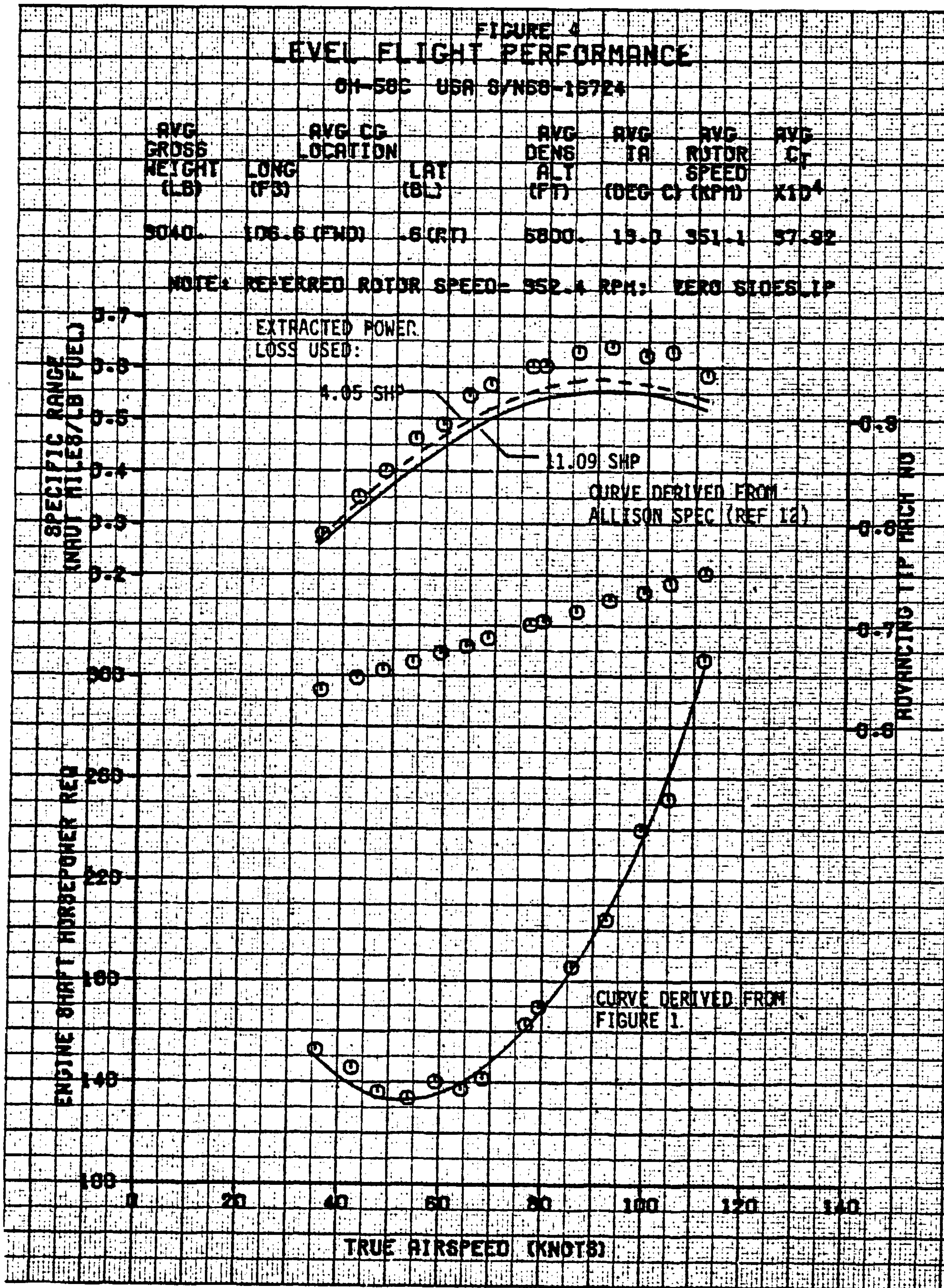


FIGURE 4
LEVEL FLIGHT PERFORMANCE
OH-58C USA S/N68-16724
AVG GROSS WEIGHT (LB) 3040.
AVG CG LOCATION LONG (FS) 106.6 (FWD) LAT (BL) .6 (RT)
AVG DENS ALT (FT) 5800.
AVG TA (DEG C) 13.0
AVG ROTOR SPEED (RPM) 351.1
AVG C_T X10[4] 37.92
NOTE: REFERRED ROTOR SPEED= 352.4 RPM: ZERO SIDESLIP
EXTRACTED POWER LOSS USED:
4.05 SHP
11.09 SHP
CURVE DERIVED FROM ALLISON SPEC (REF 12)
CURVE DERIVED FROM FIGURE 1.
SPECIFIC RANGE (NAUT MILES/LB FUEL)
ENGINE SHAFT HORSEPOWER REQ
ADVANCING TIP MACH NO
TRUE AIRSPEED (KNOTS)

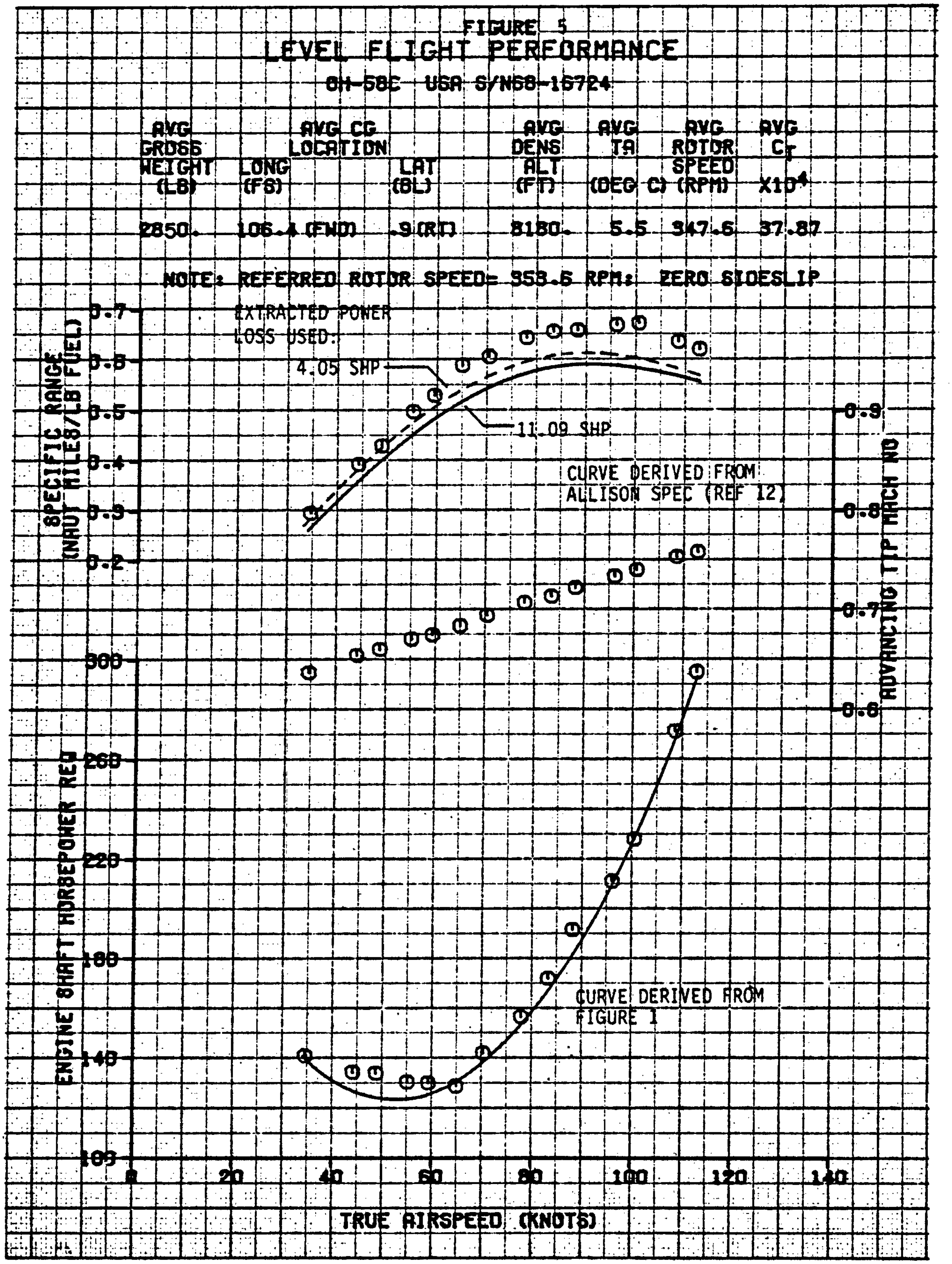


FIGURE 5
LEVEL FLIGHT PERFORMANCE
OH-58C USA S/N68-16724
AVG GROSS WEIGHT (LB) 2850.
AVG CG LOCATION LONG (FS) 106.4 (FWD)
LAT (BL) .9 (RT)
AVG DENS ALT (FT) 8180.
AVG TA (DEG C) 5.5
AVG ROTOR SPEED (RPM) 347.6
AVG C_T X10[4] 37.87
NOTE: REFERRED ROTOR SPEED= 353.6 RPM: ZERO SIDESLIP
EXTRACTED POWER LOSS USED:
4.05 SHP
11.09 SHP
CURVE DERIVED FROM ALLISON SPEC (REF 12)
CURVE DERIVED FROM FIGURE 1
SPECIFIC RANGE (NAUT MILES/LB FUEL)
ENGINE SHAFT HORSEPOWER REQ
ADVANCING TIP MACH NO
TRUE AIRSPEED (KNOTS)

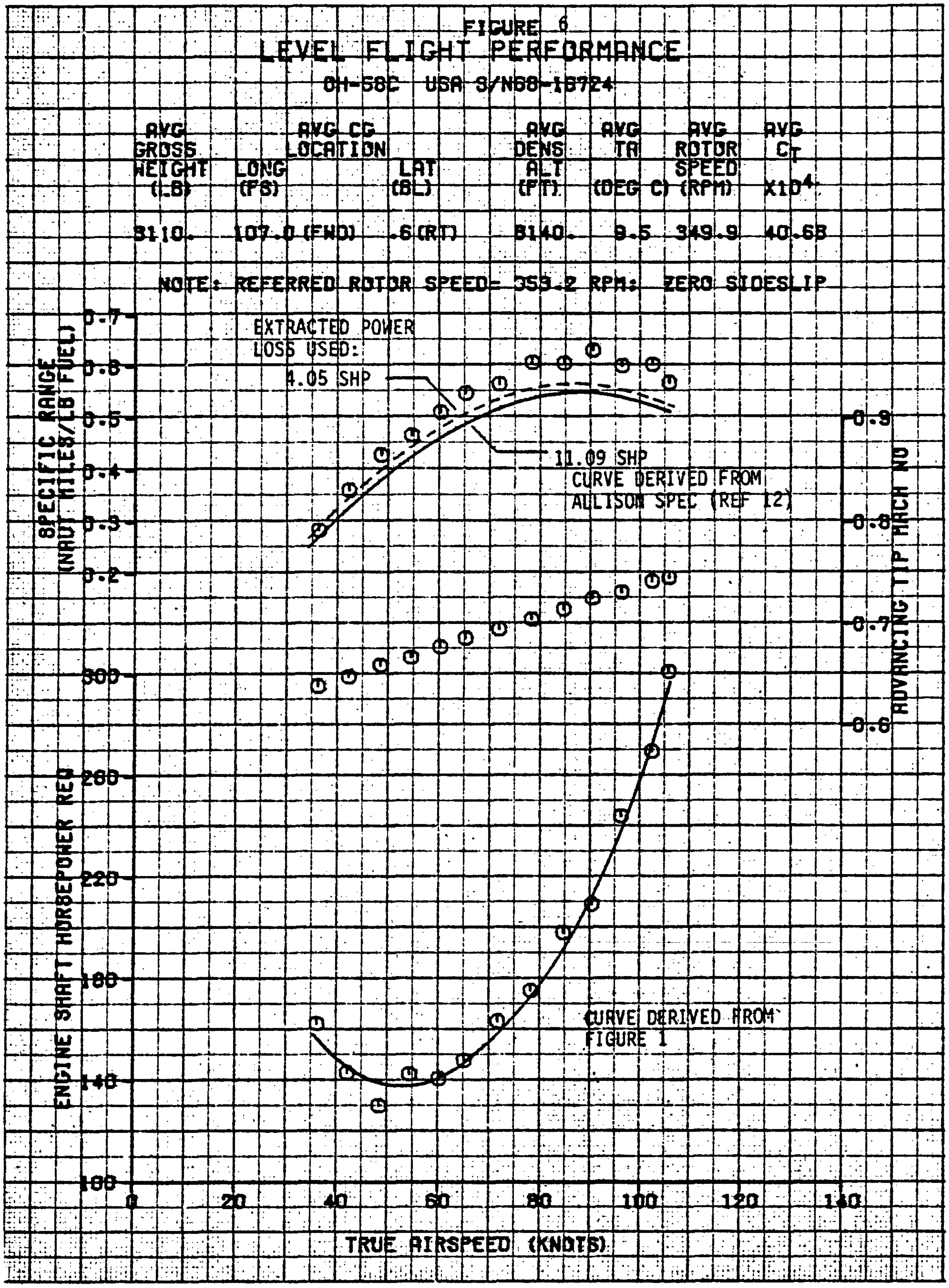
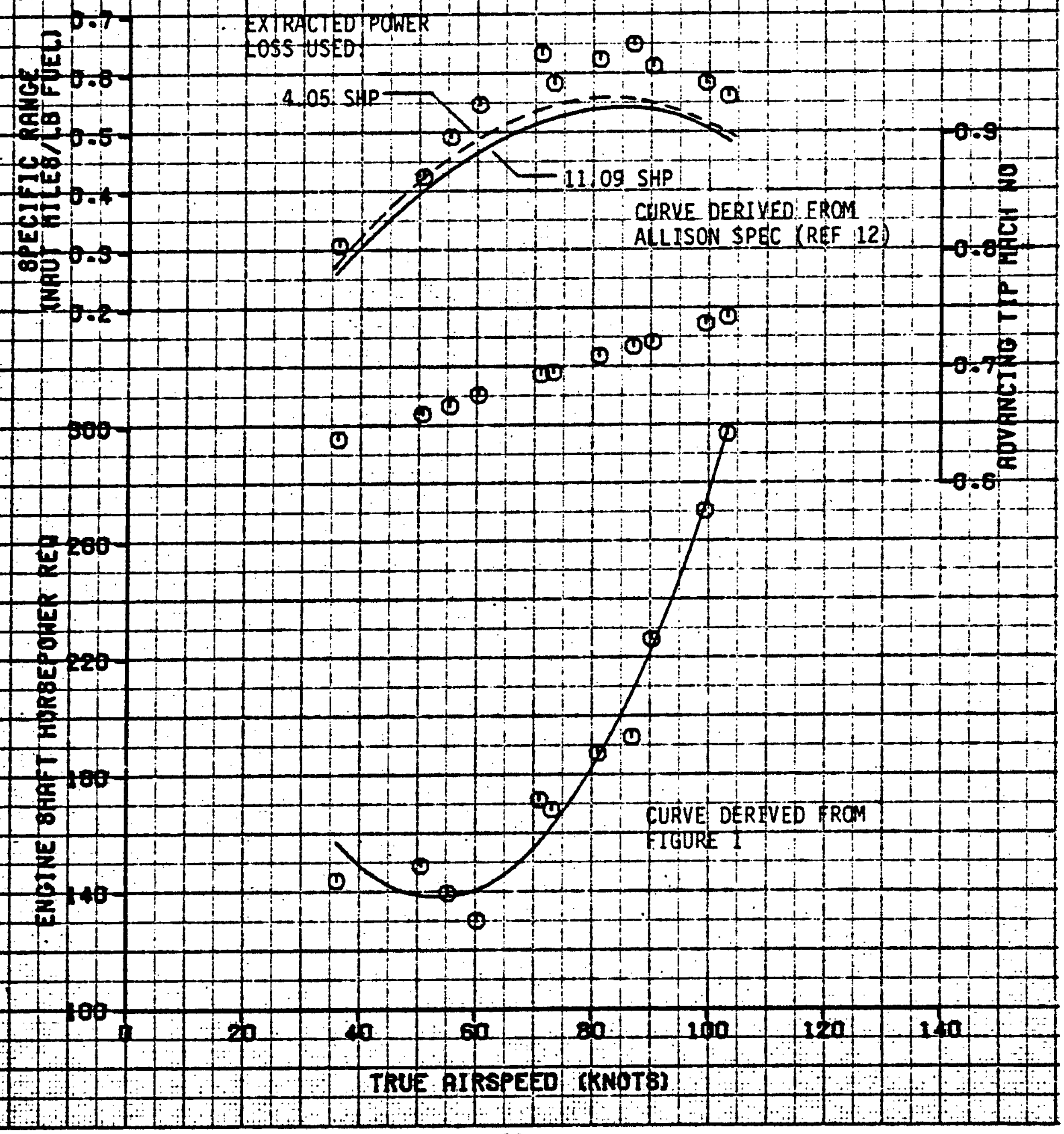


FIGURE 6
LEVEL FLIGHT PERFORMANCE
OH-58C USA S/N68-16724
AVG GROSS WEIGHT (LB)
AVG CG LOCATION
LONG (FS)
LAT (BL)
AVG DENS ALT (FT)
AVG TA (DEG C)
AVG ROTOR SPEED (RPM)
AVG C_T X10^4
3110.
107.0 (FWD)
.6 (RT)
3140.
9.5
349.9
40.68
NOTE: REFERRED ROTOR SPEED= 353.2 RPM: ZERO SIDESLIP
EXTRACTED POWER LOSS USED:
4.05 SHP
11.09 SHP
CURVE DERIVED FROM ALLISON SPEC (REF 12)
CURVE DERIVED FROM FIGURE 1
SPECIFIC RANGE (NAUT MILES/LB FUEL)
ENGINE SHAFT HORSEPOWER REQ
ADVANCING TIP MACH NO
TRUE AIRSPEED (KNOTS)

FIGURE 7
LEVEL FLIGHT PERFORMANCE
OH-58C USA S/N68-16724

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG DENS ALT (FT)	AVG TA (DEG C)	AVG ROTOR SPEED (RPM)	AVG C_T $X10^4$
3010.	106.2 (FWD)	.6 (RT)	10640.	8.0	348.5	43.08

NOTE: REFERRED ROTOR SPEED= 352.7 RPM: ZERO SIDESLIP



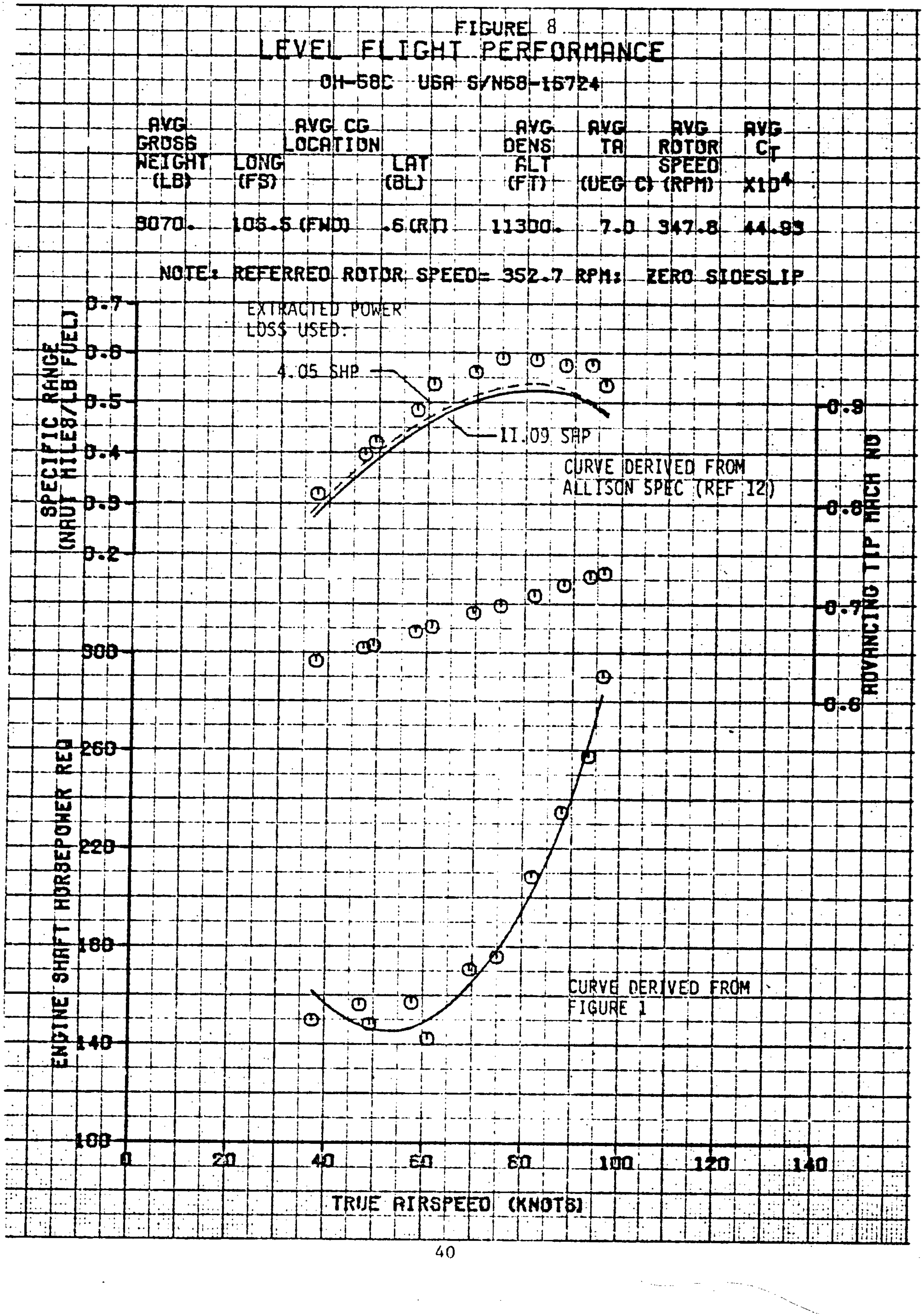


FIGURE 8
LEVEL FLIGHT PERFORMANCE
OH-58C USA S/N68-16724
AVG GROSS WEIGHT (LB)
AVG CG LOCATION
LONG (FS)
LAT (BL)
AVG DENS ALT (FT)
AVG TA (DEG C)
AVG ROTOR SPEED (RPM)
AVG CT X10⁴
3070. 106.5 (FWD) .6 (RT) 11300. 7.0 347.8 44.93
NOTE: REFERRED ROTOR SPEED= 352.7 RPM: ZERO SIDESLIP
EXTRACTED POWER LOSS USED:
4.05 SHP
11.09 SHP
CURVE DERIVED FROM ALLISON SPEC (REF 12)
CURVE DERIVED FROM FIGURE 1
SPECIFIC RANGE (NAUT MILES/LB FUEL)
0.7
0.6
0.5
0.4
0.3
0.2
ADVANCING TIP MACH NO
0.9
0.8
0.7
0.6
ENGINE SHAFT HORSEPOWER REQ
300
260
220
180
140
100
0
20
40
60
80
100
120
140
TRUE AIRSPEED (KNOTS)

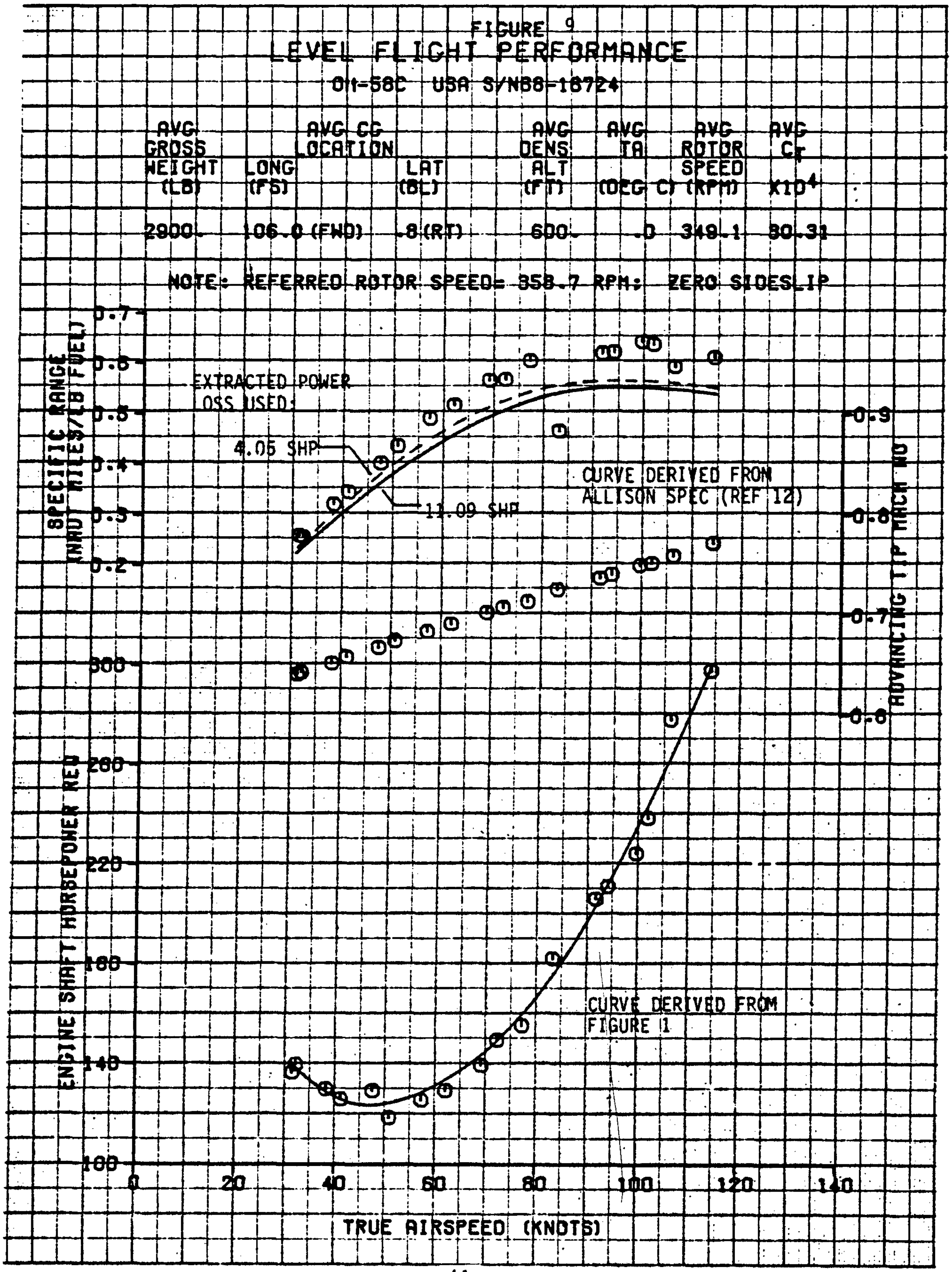


FIGURE 9
LEVEL FLIGHT PERFORMANCE
OH-58C USA S/N68-16724
AVG GROSS WEIGHT (LB)
AVG CG LOCATION
LONG (FS)
LAT (BL)
AVG DENS ALT (FT)
AVG TA (DEG C)
AVG ROTOR SPEED (RPM)
AVG CT X10⁴
2900
106.0 (FWD)
.8 (RT)
600
.0
349.1
30.31
NOTE: REFERRED ROTOR SPEED= 358.7 RPM; ZERO SIDESLIP
EXTRACTED POWER LOSS USED:
4.05 SHP
11.09 SHP
CURVE DERIVED FROM ALLISON SPEC (REF 12)
CURVE DERIVED FROM FIGURE 1
SPECIFIC RANGE (NAUT MILES/LB FUEL)
ENGINE SHAFT HORSEPOWER REQ
ADVANCING TIP MACH NO
TRUE AIRSPEED (KNOTS)
0.2
0.3
0.4
0.5
0.6
0.7
100
140
180
220
260
300
0.6
0.7
0.8
0.9
0
20
40
60
80
100
120
140

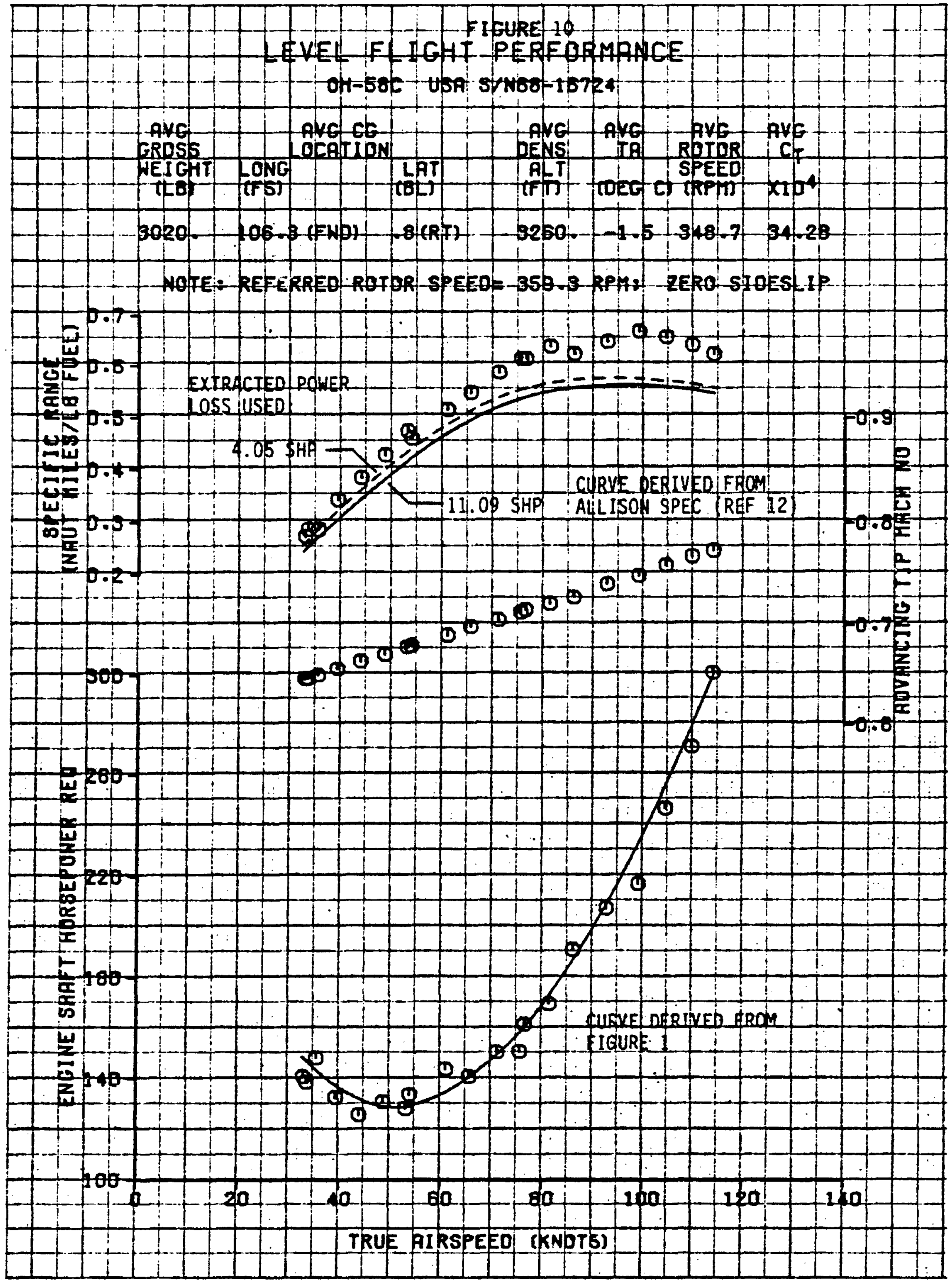


FIGURE 10
LEVEL FLIGHT PERFORMANCE
OH-58C USA S/N68-16724
AVG GROSS WEIGHT (LB)
AVG CG LOCATION
LONG (FS)
LAT (BL)
AVG DENS ALT (FT)
AVG TA (DEG C)
AVG ROTOR SPEED (RPM)
AVG C_T X10[4]
3020.
106.3 (FWD)
.8 (RT)
3260.
-1.5
348.7
34.28
NOTE: REFERRED ROTOR SPEED= 359.3 RPM; ZERO SIDESLIP
SPECIFIC RANGE (NAUT MILES/LB FUEL)
EXTRACTED POWER LOSS USED
4.05 SHP
11.09 SHP
CURVE DERIVED FROM ALLISON SPEC (REF 12)
ADVANCING TIP MACH NO
ENGINE SHAFT HORSEPOWER REQ
CURVE DERIVED FROM FIGURE 1
TRUE AIRSPEED (KNOTS)
0.7
0.6
0.5
0.4
0.3
0.2
300
260
220
180
140
100
0
20
40
60
80
100
120
140
0.9
0.8
0.7
0.6

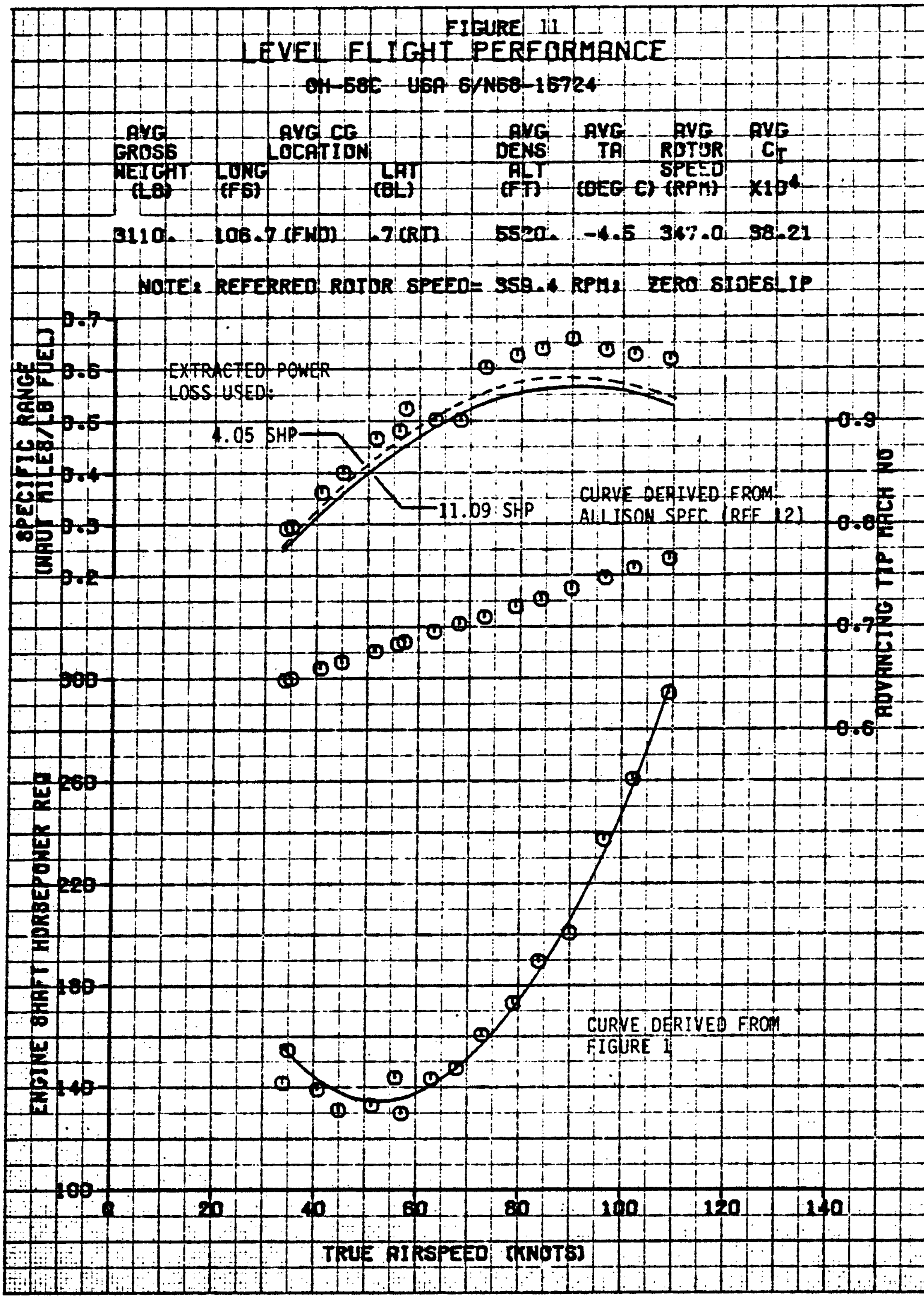


FIGURE 11
LEVEL FLIGHT PERFORMANCE

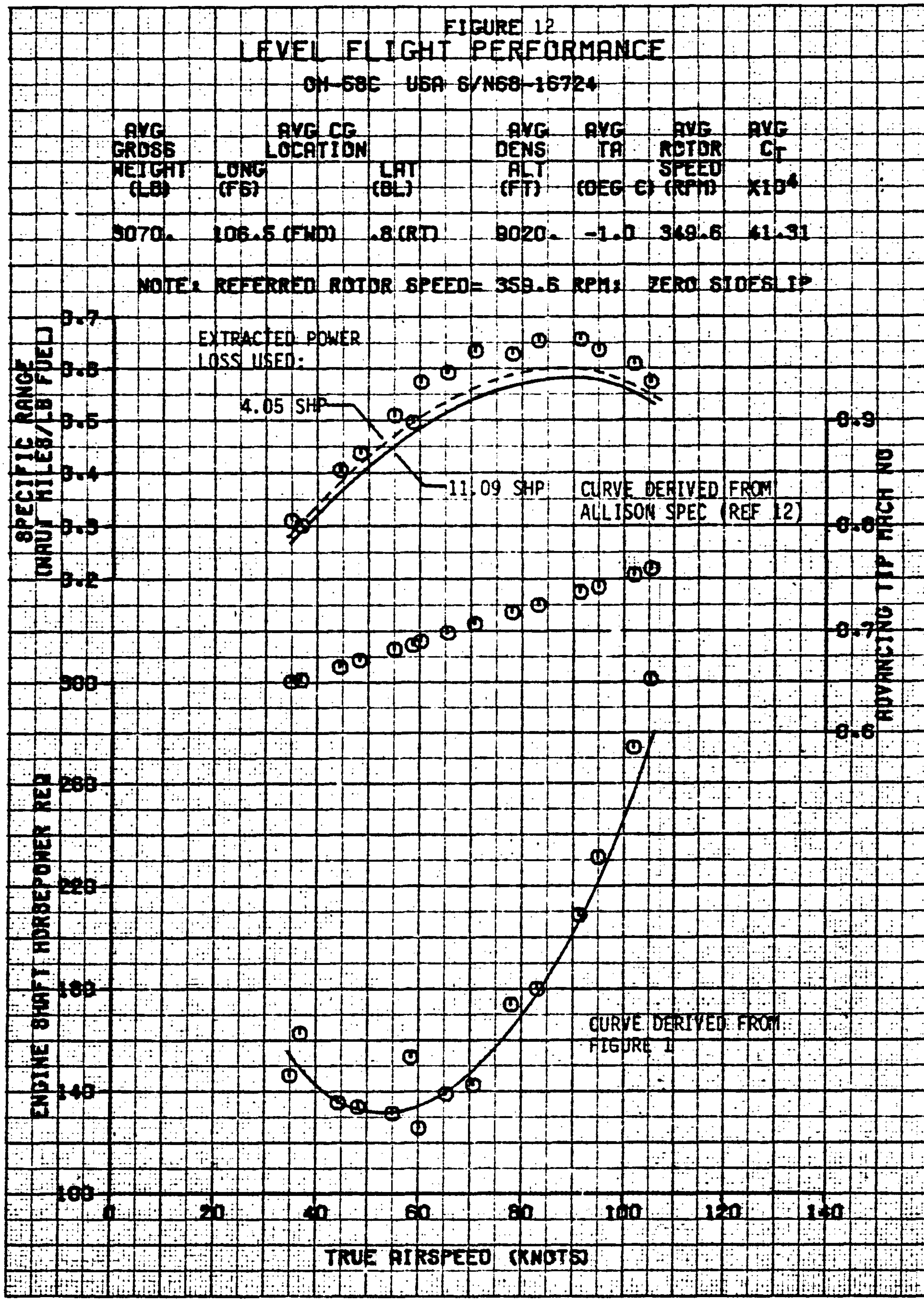
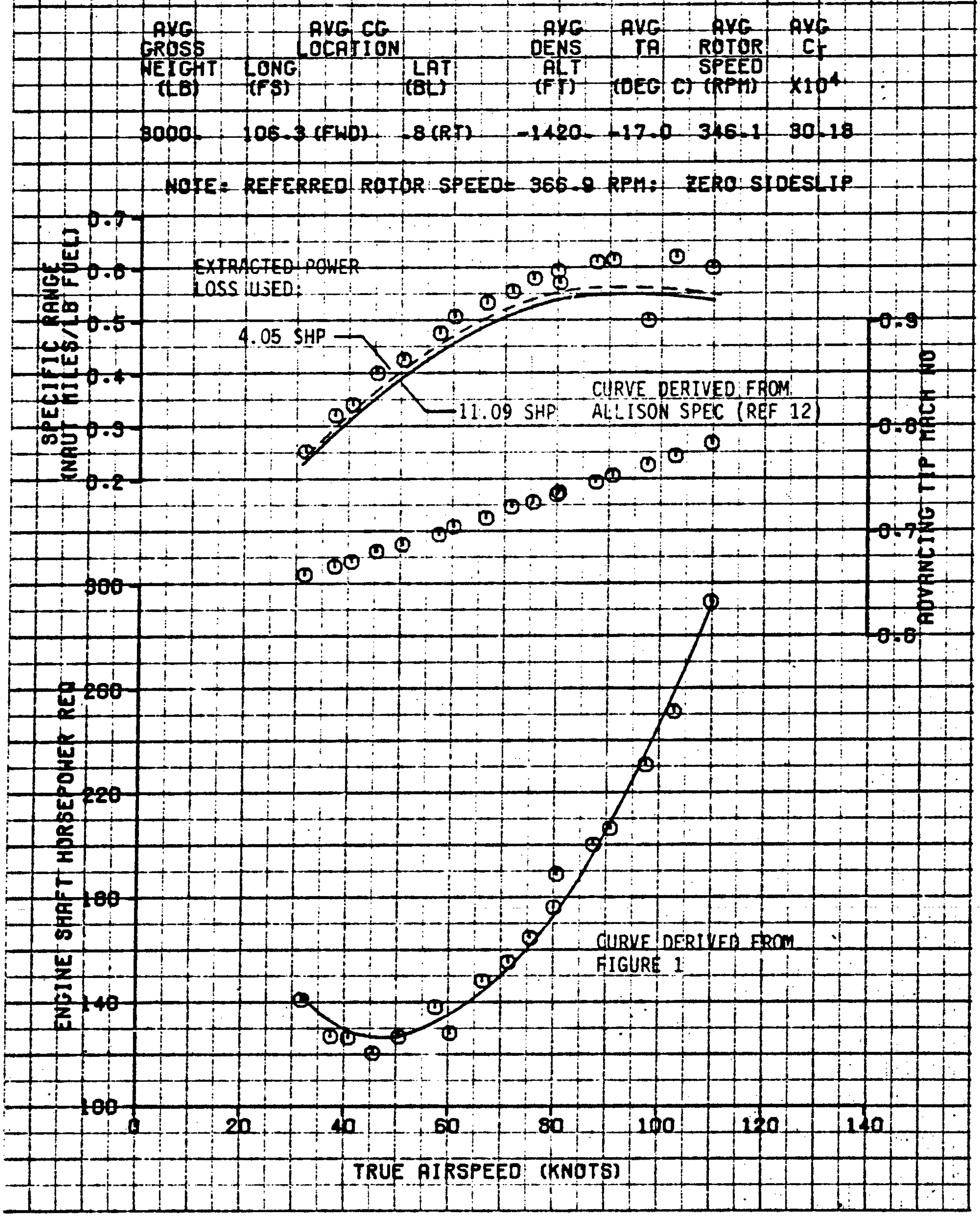


FIGURE 12
LEVEL FLIGHT PERFORMANCE
OH-58C USA S/N68-16724
AVG GROSS WEIGHT (LB)
AVG CG LOCATION
LONG (FS)
LAT (BL)
AVG DENS ALT (FT)
AVG TA (DEG C)
AVG ROTOR SPEED (RPM)
AVG C_T X10⁴
3070.
106.5 (FWD)
.8 (RT)
8020.
-1.0
349.6
41.31
NOTE: REFERRED ROTOR SPEED= 359.6 RPM; ZERO SIDESLIP
EXTRACTED POWER LOSS USED:
4.05 SHP
11.09 SHP
CURVE DERIVED FROM ALLISON SPEC (REF 12)
CURVE DERIVED FROM FIGURE 1
SPECIFIC RANGE (NAUT MILES/LB FUEL)
ENGINE SHAFT HORSEPOWER REQ
ADVANCING TIP MACH NO
TRUE AIRSPEED (KNOTS)

FIGURE 13

LEVEL FLIGHT PERFORMANCE

OH-58C USA S/N68-16724



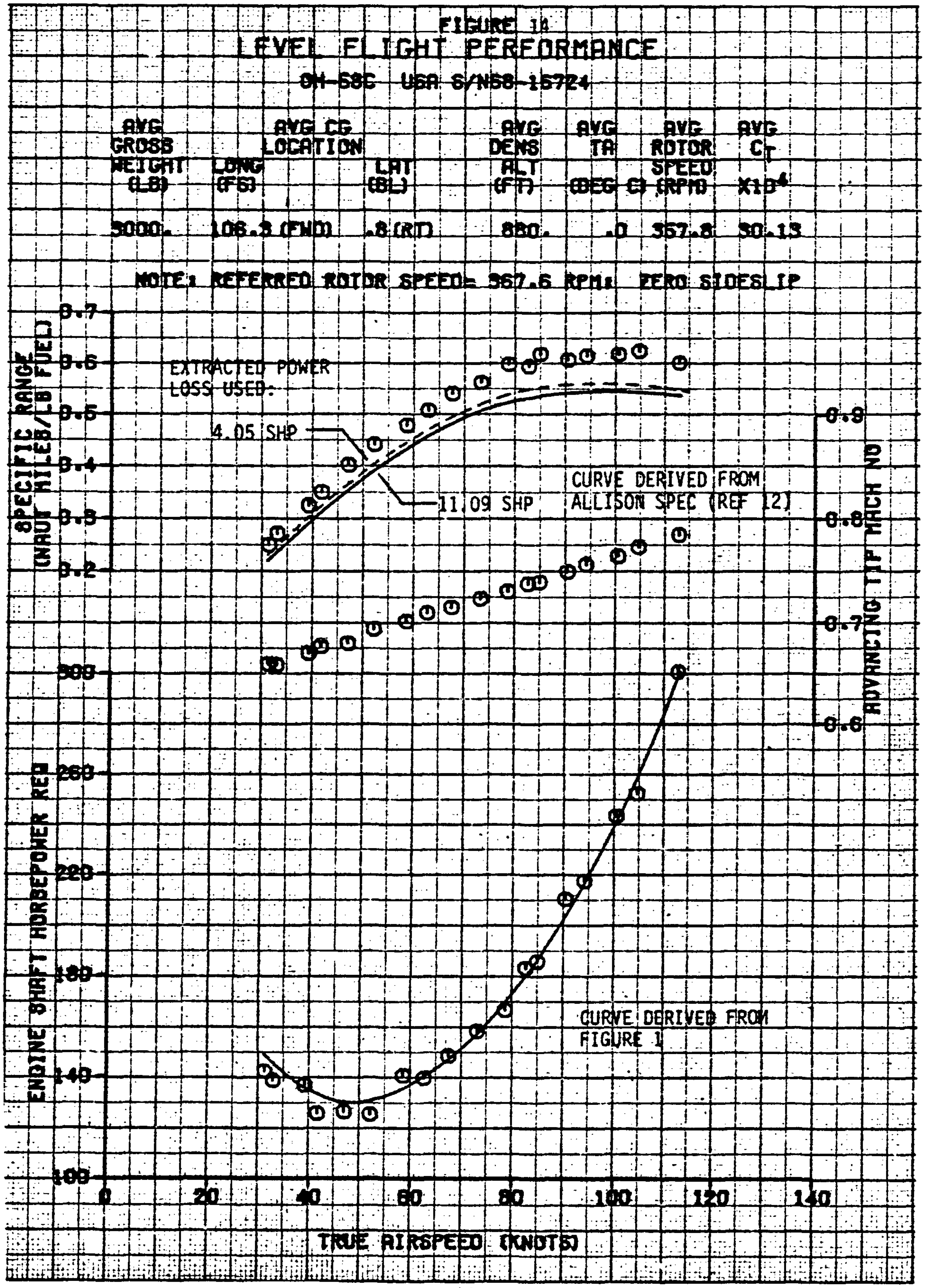


FIGURE 14
LEVEL FLIGHT PERFORMANCE
OH-58C USA S/N68-15724
AVG GROSS WEIGHT (LB)
AVG CG LOCATION
LONG (FS)
LAT (BL)
AVG DENS ALT (FT)
AVG TA (DEG C)
AVG ROTOR SPEED (RPM)
AVG C_T X10^4
3000. 106.3 (FWD) .8 (RT) 880. .0 357.8 30.13
NOTE: REFERRED ROTOR SPEED= 367.6 RPM; ZERO SIDESLIP
EXTRACTED POWER LOSS USED:
4.05 SHP
11.09 SHP
CURVE DERIVED FROM ALLISON SPEC (REF 12)
CURVE DERIVED FROM FIGURE 1
SPECIFIC RANGE (NAUT MILES/LB FUEL)
ENGINE SHAFT HORSEPOWER REQ
ADVANCING TIP MACH NO
TRUE AIRSPEED (KNOTS)
0.7
0.6
0.5
0.4
0.3
0.2
300
260
220
180
140
100
0.9
0.8
0.7
0.6
0
20
40
60
80
100
120
140

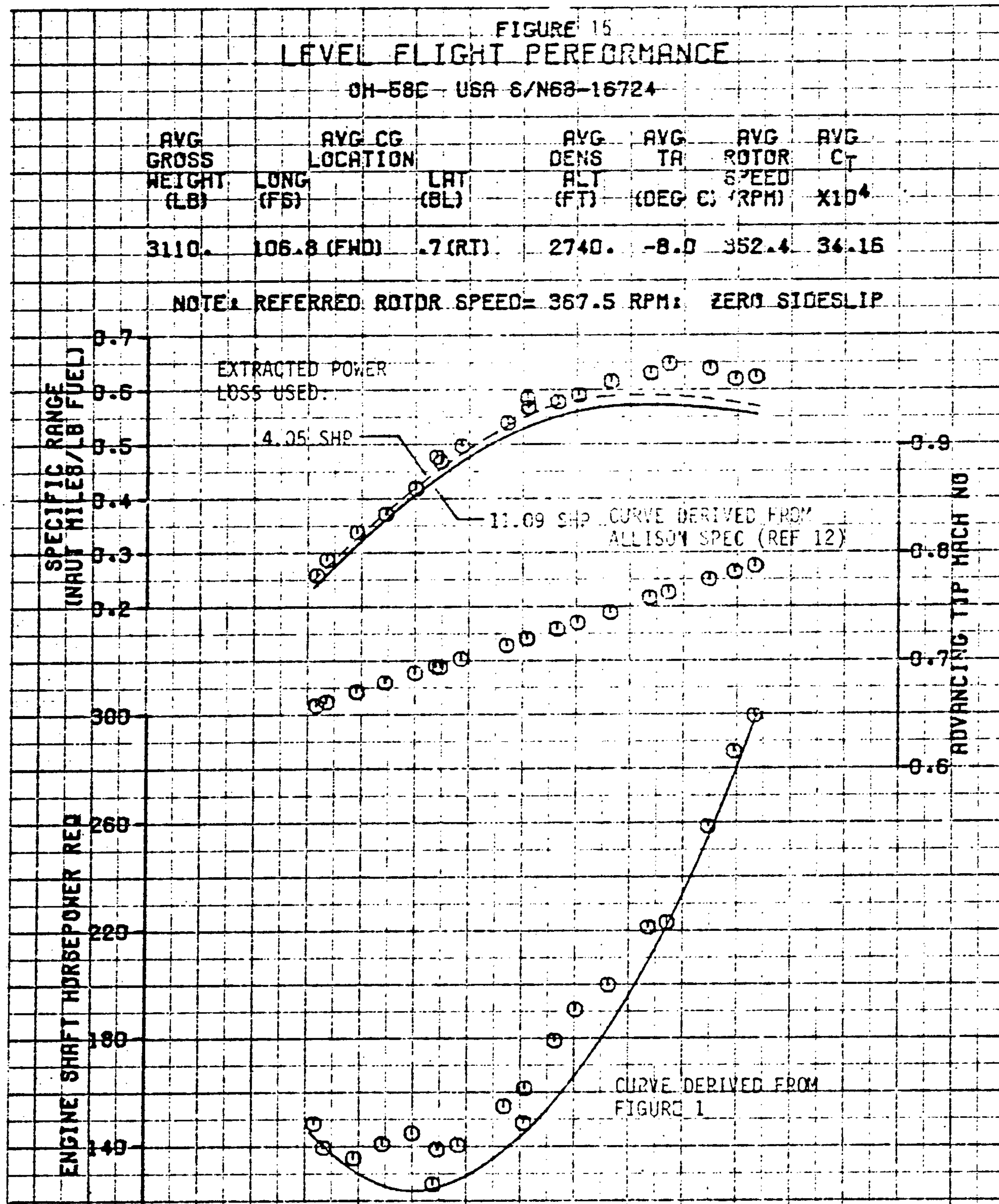


FIGURE 15
LEVEL FLIGHT PERFORMANCE
OH-58C USA S/N68-16724
AVG GROSS WEIGHT (LB)
AVG CG LOCATION
LONG (FS)
LAT (BL)
AVG DENS ALT (FT)
AVG TA (DEG C)
AVG ROTOR SPEED (RPM)
AVG C_T X10[4]
3110.
106.8 (FWD)
.7 (RT)
2740.
-8.0
352.4
34.16
NOTE: REFERRED ROTOR SPEED= 367.5 RPM: ZERO SIDESLIP
EXTRACTED POWER LOSS USED:
4.05 SHP
11.09 SHP
CURVE DERIVED FROM ALLISON SPEC (REF 12)
SPECIFIC RANGE (NAUT MILES/LB FUEL)
ADVANCING TIP MACH NO
ENGINE SHAFT HORSEPOWER REQ
CURVE DERIVED FROM FIGURE 1
TRUE AIRSPEED (KNOTS)

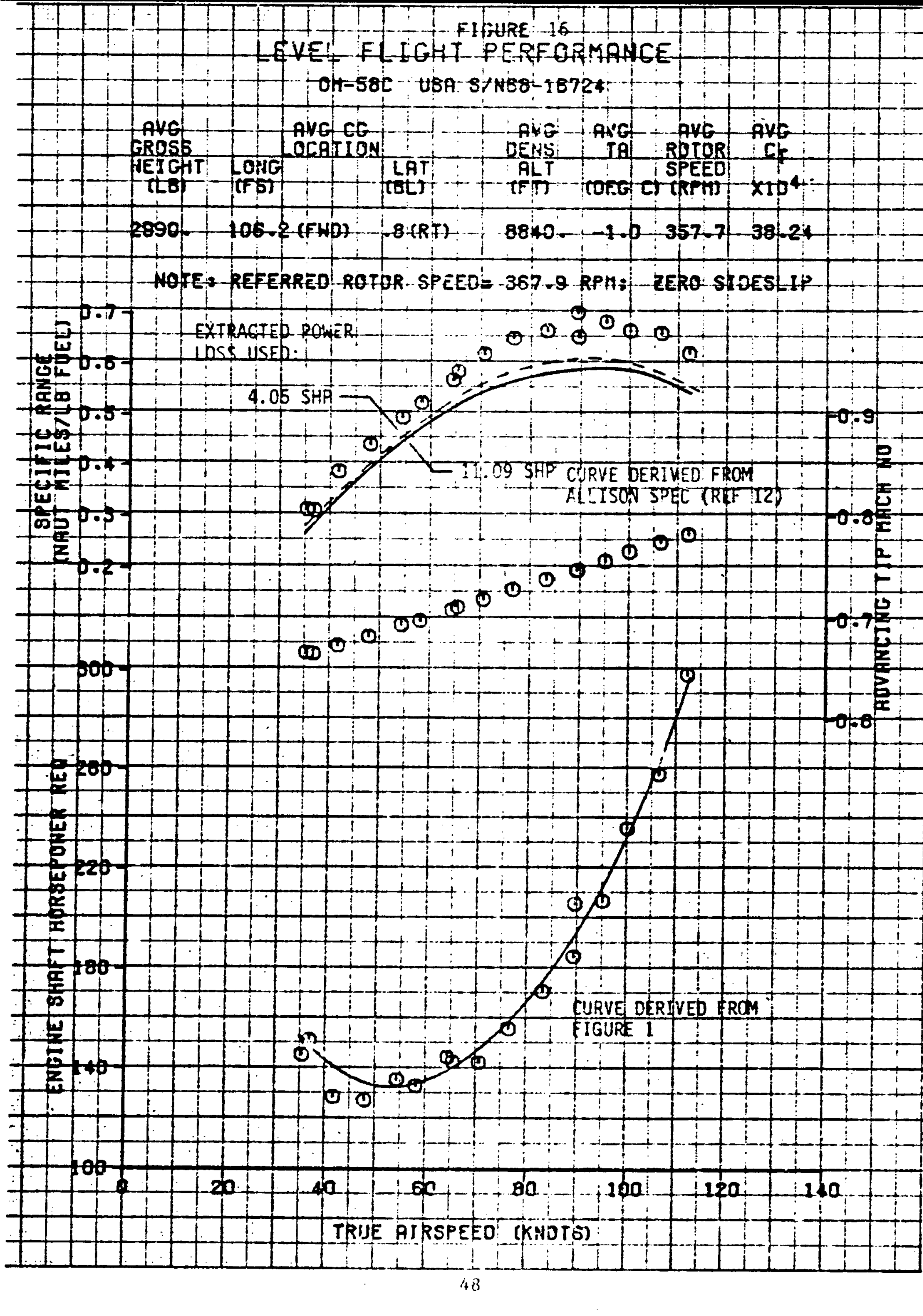


FIGURE 16
LEVEL FLIGHT PERFORMANCE
OH-58C USA S/N68-16724
AVG GROSS WEIGHT (LB)
AVG CG LOCATION
LONG (FS)
LAT (BL)
AVG DENS ALT (FT)
AVG TA (DEG C)
AVG ROTOR SPEED (RPM)
AVG CT X10⁴
2990. 106.2 (FWD) .8 (RT) 8840. -1.0 357.7 38.24
NOTE: REFERRED ROTOR SPEED= 367.9 RPM; ZERO SIDESLIP
EXTRACTED POWER LOSS USED:
4.05 SHP
11.09 SHP
CURVE DERIVED FROM ALLISON SPEC (REF 12)
CURVE DERIVED FROM FIGURE 1
SPECIFIC RANGE (NAUT MILES/LB FUEL)
ENGINE SHAFT HORSEPOWER REQ
ADVANCING TIP MACH NO
TRUE AIRSPEED (KNOTS)

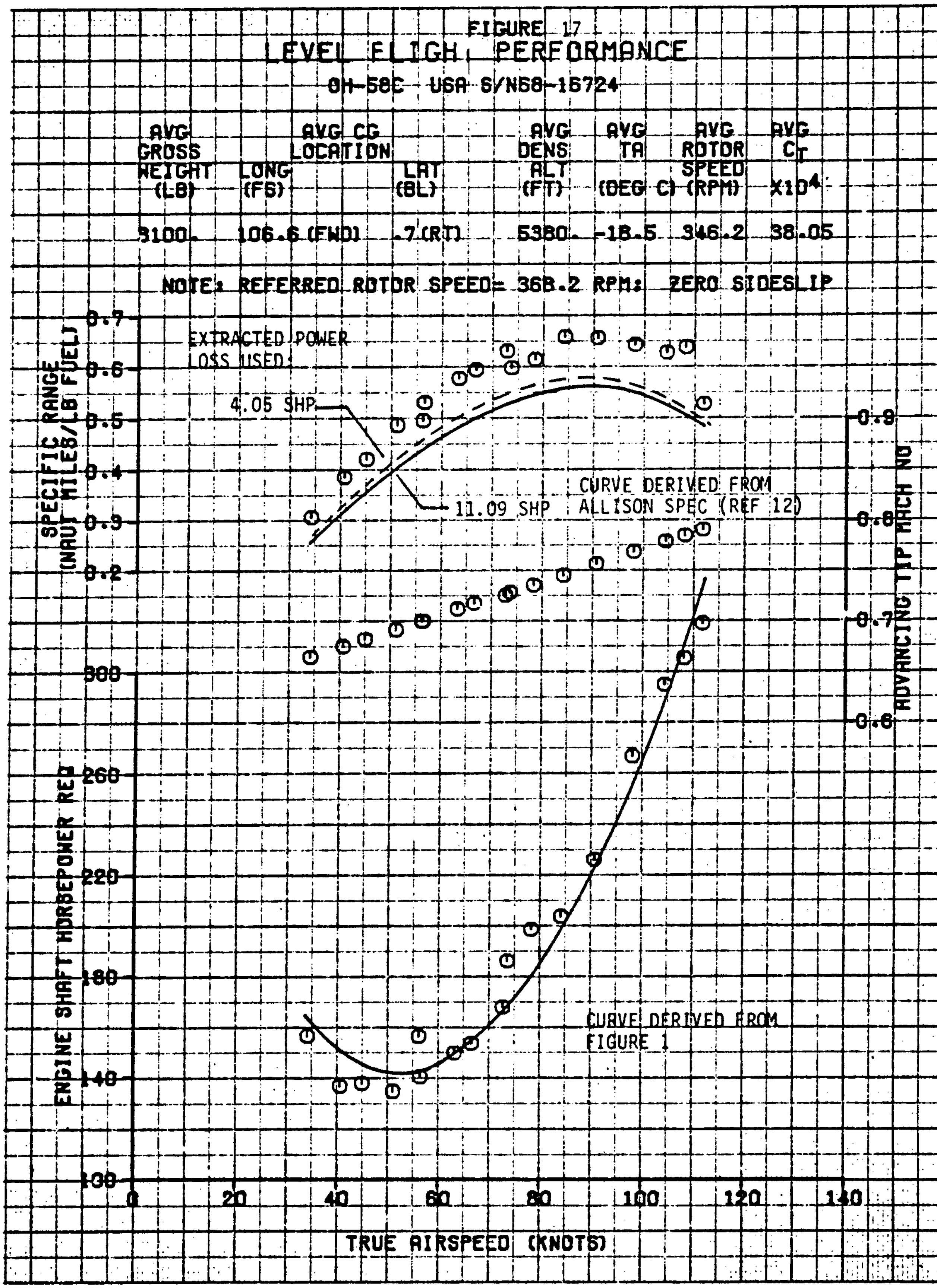
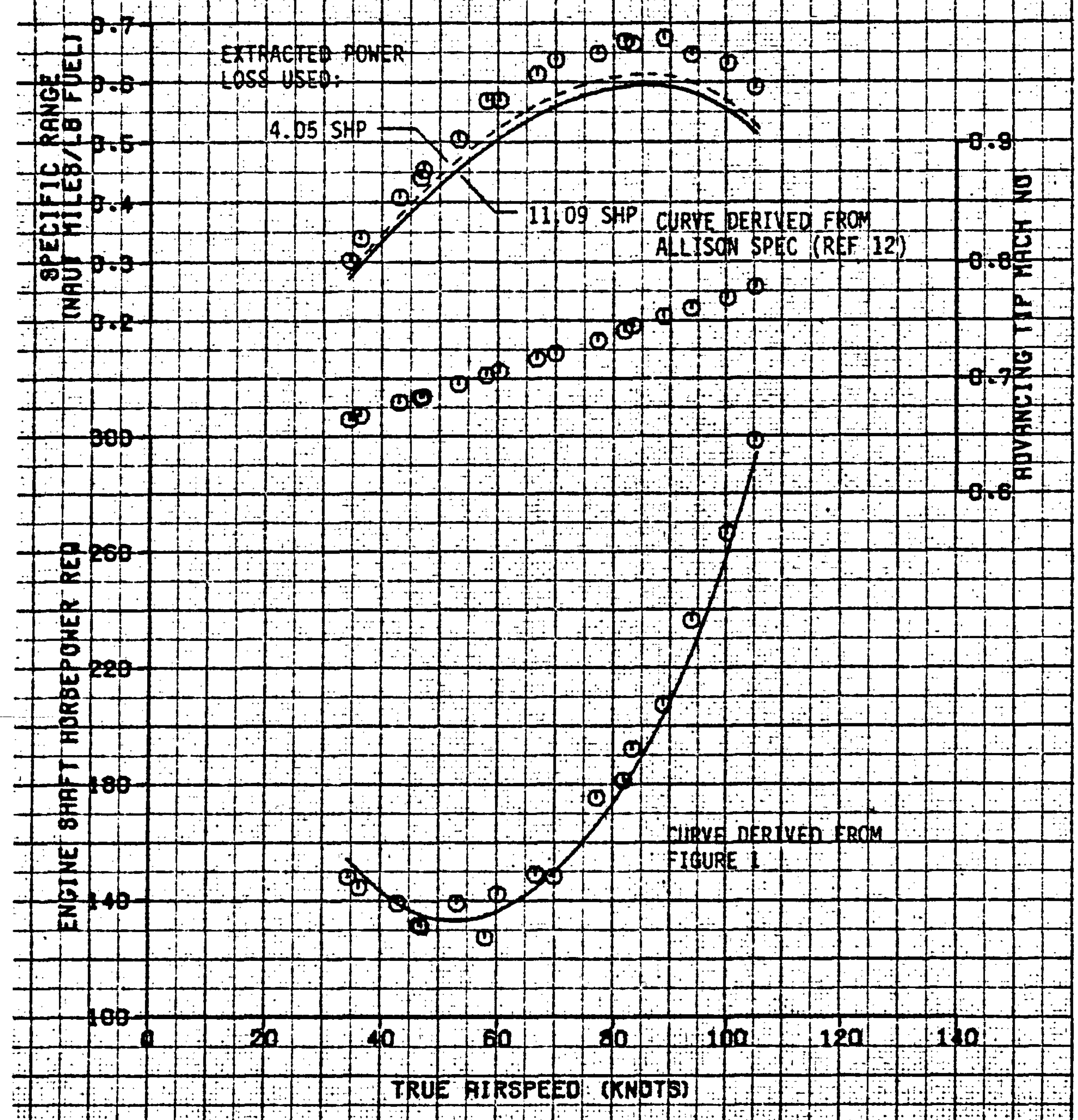


FIGURE 17
LEVEL FLIGHT PERFORMANCE
OH-58C USA S/N68-16724
AVG GROSS WEIGHT (LB)
AVG CG LOCATION
LONG (FS)
LAT (BL)
AVG DENS ALT (FT)
AVG TA (DEG C)
AVG ROTOR SPEED (RPM)
AVG C_T $X10^4$
3100
106.6 (FWD)
.7 (RT)
5380
-18.5
346.2
38.05
NOTE: REFERRED ROTOR SPEED= 368.2 RPM: ZERO SIDESLIP
EXTRACTED POWER LOSS USED:
4.05 SHP
11.09 SHP
CURVE DERIVED FROM ALLISON SPEC (REF 12)
CURVE DERIVED FROM FIGURE 1
SPECIFIC RANGE (NAUT MILES/LB FUEL)
ENGINE SHAFT HORSEPOWER REQ
ADVANCING TIP MACH NO
TRUE AIRSPEED (KNOTS)
0.7
0.6
0.5
0.4
0.3
0.2
300
260
220
180
140
100
0
20
40
60
80
100
120
140
0.9
0.8
0.7
0.6

FIGURE 18
LEVEL FLIGHT PERFORMANCE
OH-58C USA S/N68-16724

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG DENS ALT (FT)	AVG TA (DEG C)	AVG ROTOR SPEED (RPM)	AVG C_T $X10^4$
3010	106.3 (FWD)	.8 (RT)	8840	-18.5	346.1	41.15

NOTE: REFERRED ROTOR SPEED= 368.1 RPM; ZERO SIDESLIP



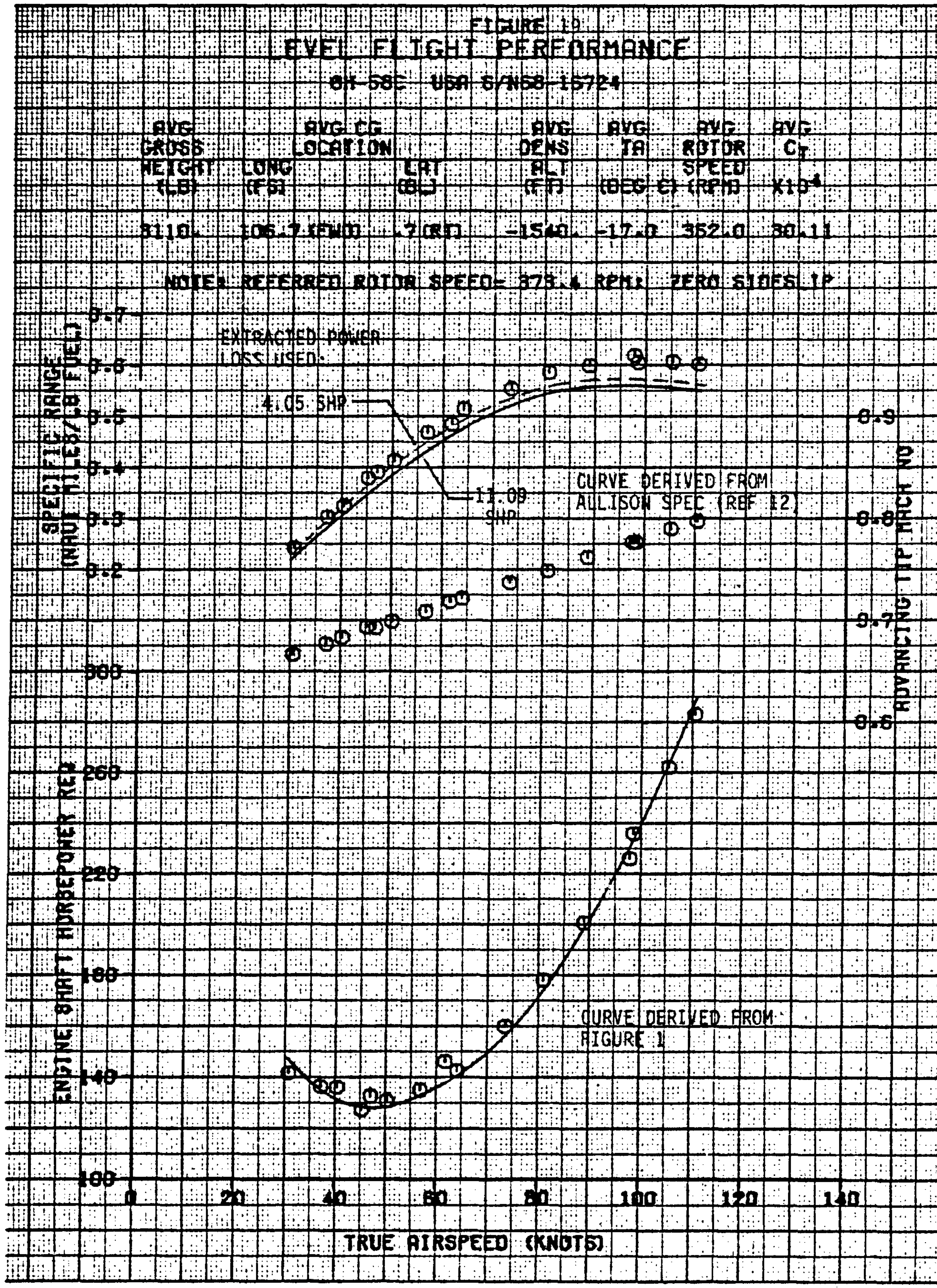


FIGURE 19
LEVEL FLIGHT PERFORMANCE
OH-58C USA S/N68-16724
AVG GROSS WEIGHT (LB)
AVG CG LOCATION
LONG (FS)
LAT (BL)
AVG DENS ALT (FT)
AVG OAT (DEG C)
AVG ROTOR SPEED (RPM)
AVG C_T X10^4
3110. 106.7(FWD) .7(RT) -1540. -17.0 352.0 30.11
NOTE: REFERRED ROTOR SPEED= 373.4 RPM; ZERO SIDESLIP
EXTRACTED POWER LOSS USED:
4.05 SHP
11.00 SHP
CURVE DERIVED FROM ALLISON SPEC (REF 12)
CURVE DERIVED FROM FIGURE 1
SPECIFIC RANGE (NAUT MILES/LB FUEL)
ENGINE SHAFT HORSEPOWER REQ
ADVANCING TIP MACH NO
TRUE AIRSPEED (KNOTS)
0.7
0.6
0.5
0.4
0.3
0.2
300
260
220
180
140
100
0
20
40
60
80
100
120
140
0.9
0.8
0.7
0.6

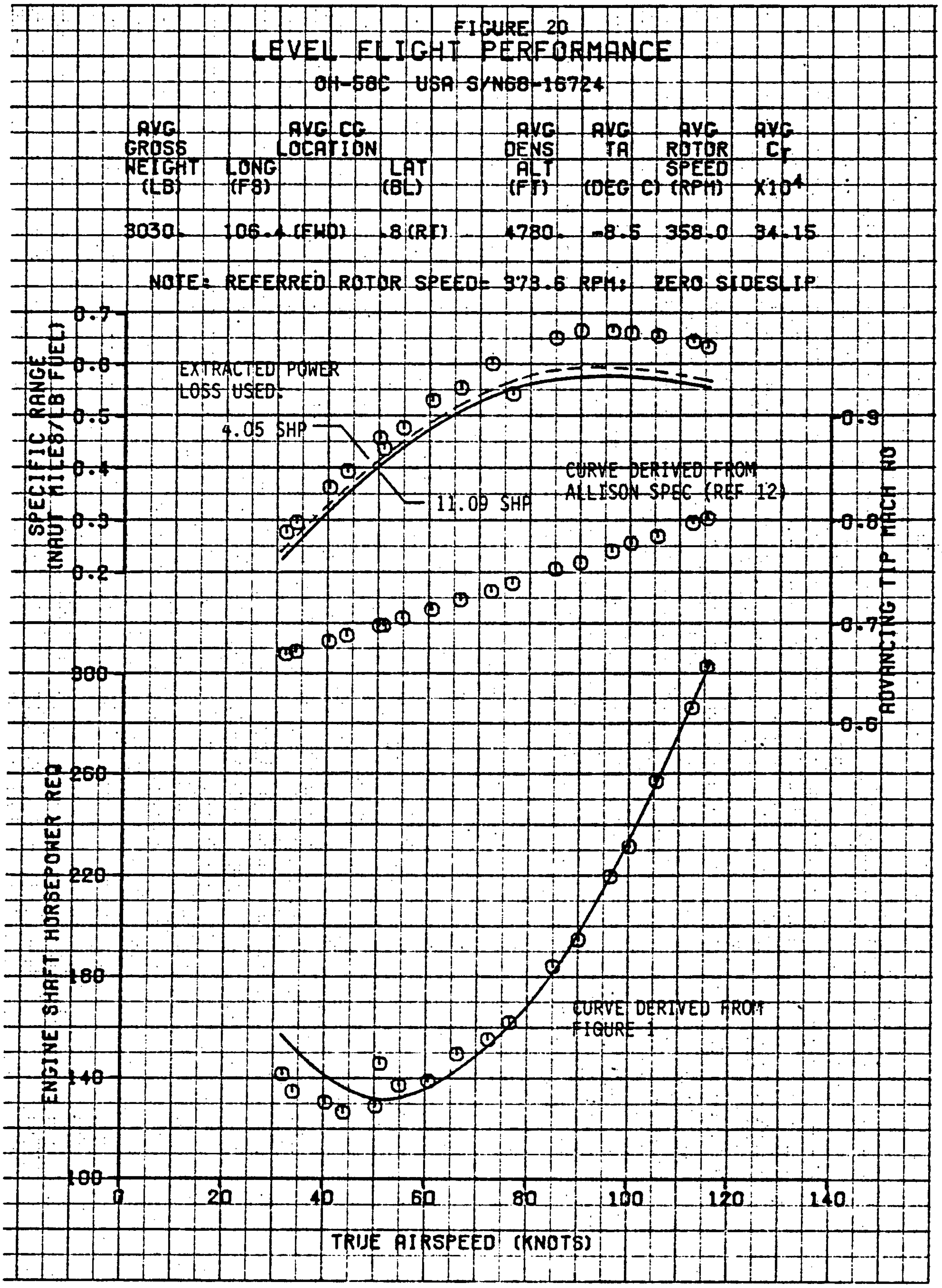


FIGURE 20
LEVEL FLIGHT PERFORMANCE
OH-58C USA S/N68-16724
AVG GROSS WEIGHT (LB)
AVG CG LOCATION
LONG (FS)
LAT (BL)
AVG DENS ALT (FT)
AVG TA (DEG C)
AVG ROTOR SPEED (RPM)
AVG CT X10^4
3030
106.4 (FWD)
.8 (RT)
4780
-8.5
358.0
34.15
NOTE: REFERRED ROTOR SPEED= 373.6 RPM: ZERO SIDESLIP
SPECIFIC RANGE (NAUT MILES/LB FUEL)
EXTRACTED POWER LOSS USED:
4.05 SHP
11.09 SHP
CURVE DERIVED FROM ALLISON SPEC (REF 12)
ADVANCING TIP MACH NO
ENGINE SHAFT HORSEPOWER REQ
CURVE DERIVED FROM FIGURE 1
TRUE AIRSPEED (KNOTS)

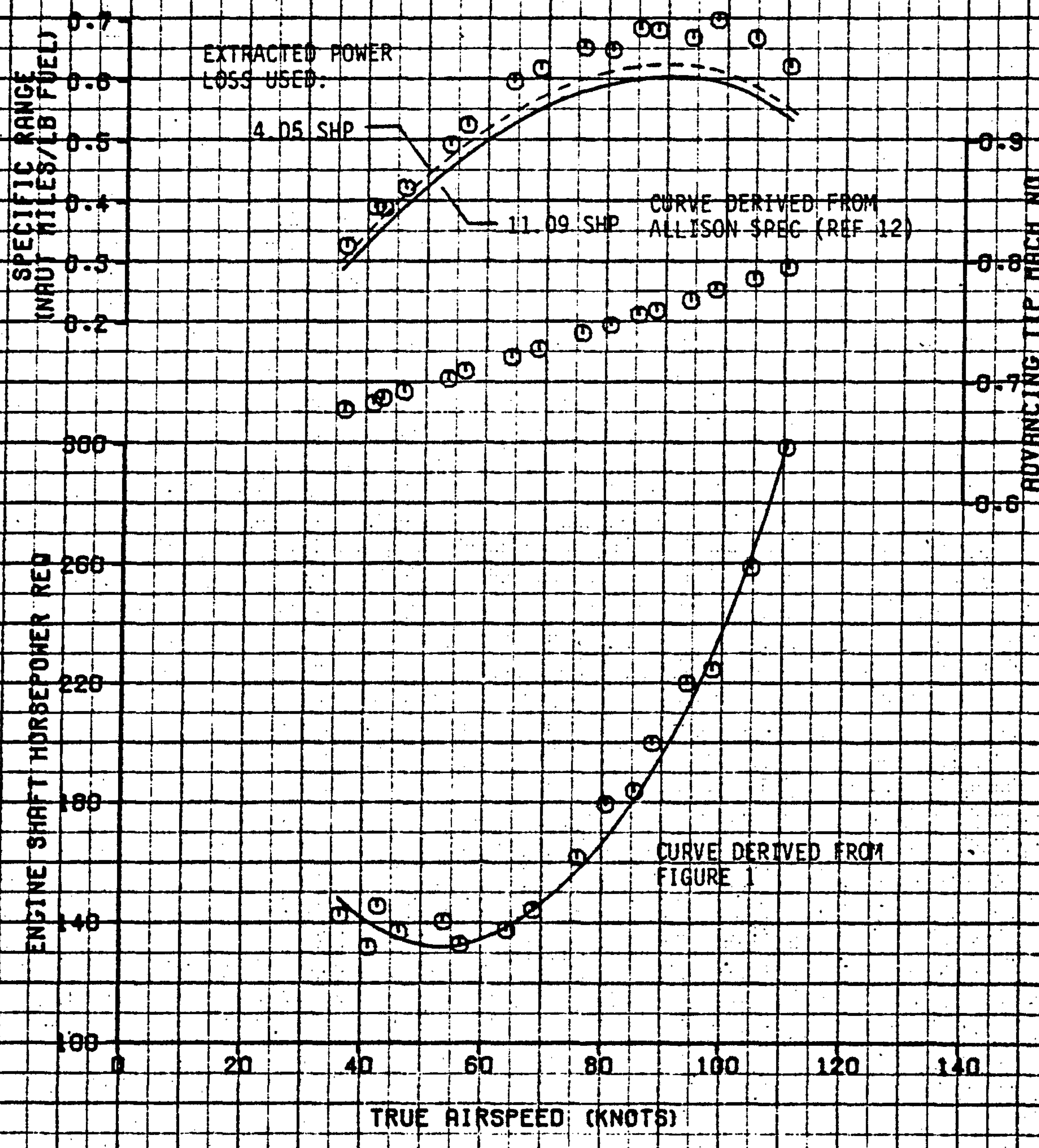
FIGURE 21

LEVEL FLIGHT PERFORMANCE

OH-58C USA S/N68-16724

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	LAT (BL)	AVG DENS ALT (FT)	AVG TA (DEG C)	AVG ROTOR SPEED (RPM)	AVG C_T $X10^4$
3020	106.3 (FWD)	.8 (RT)	7500	-17.5	351.3	38.43

NOTE: REFERRED ROTOR SPEED= 373.1 RPM: ZERO SIDESLIP



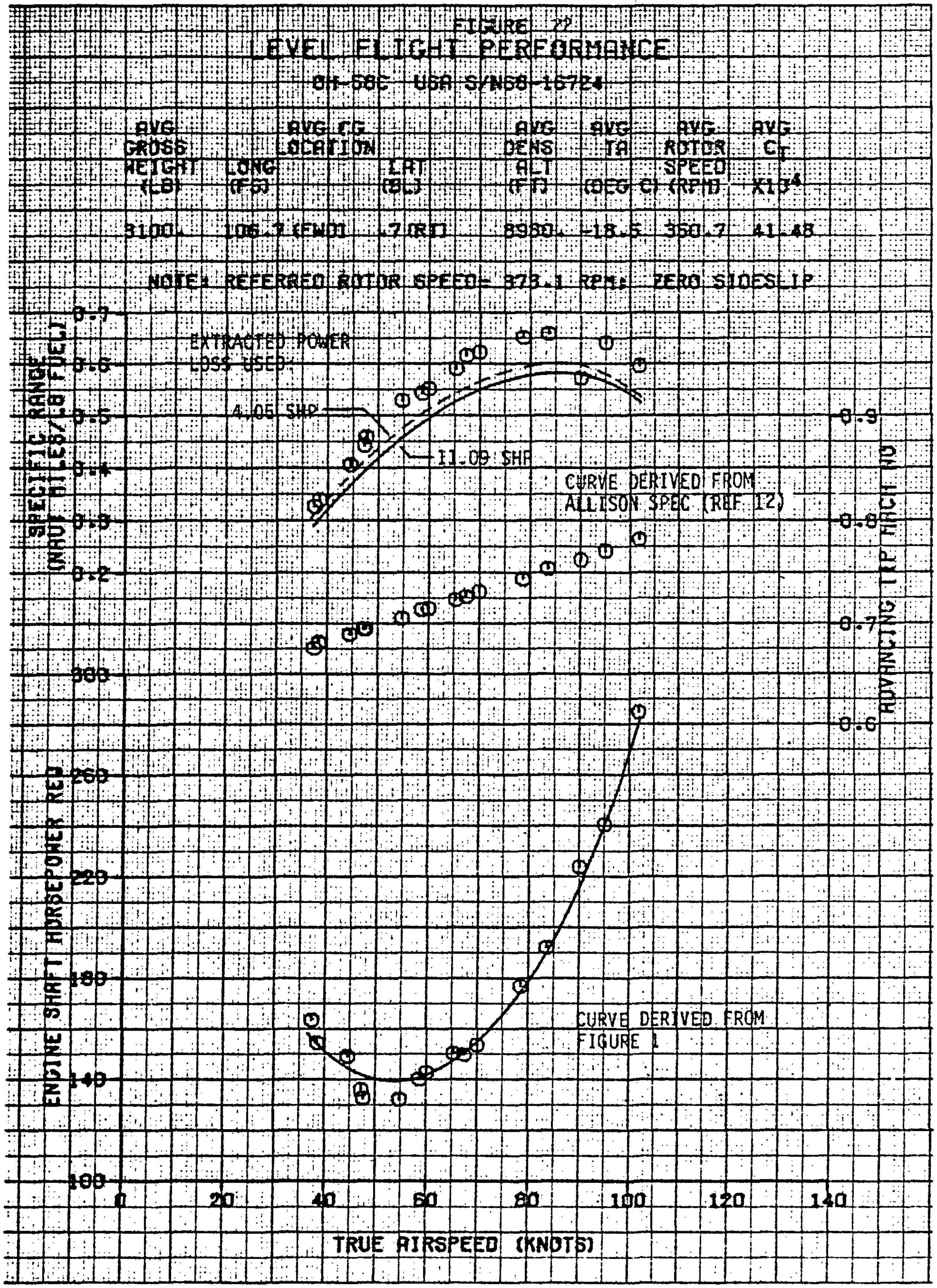


FIGURE 22
LEVEL FLIGHT PERFORMANCE
OH-58C USA S/N68-16724
AVG GROSS WEIGHT (LB)
AVG CG LOCATION
LONG (FS)
LAT (BL)
AVG DENS ALT (FT)
AVG TA (DEG C)
AVG ROTOR SPEED (RPM)
AVG C_T X10^4
3100. 106.7(FWD) .7(RT) 8980. -18.5 350.7 41.48
NOTE: REFERRED ROTOR SPEED= 373.1 RPM; ZERO SIDESLIP
EXTRACTED POWER LOSS USED:
4.05 SHP
11.09 SHP
CURVE DERIVED FROM ALLISON SPEC (REF 12)
CURVE DERIVED FROM FIGURE 1
SPECIFIC RANGE (NAUT MILES/LB FUEL)
ENGINE SHAFT HORSEPOWER REQ
ADVANCING TIP MACH NO
TRUE AIRSPEED (KNOTS)
0.2
0.3
0.4
0.5
0.6
0.7
100
140
180
220
260
300
0.6
0.7
0.8
0.9
0
20
40
60
80
100
120
140

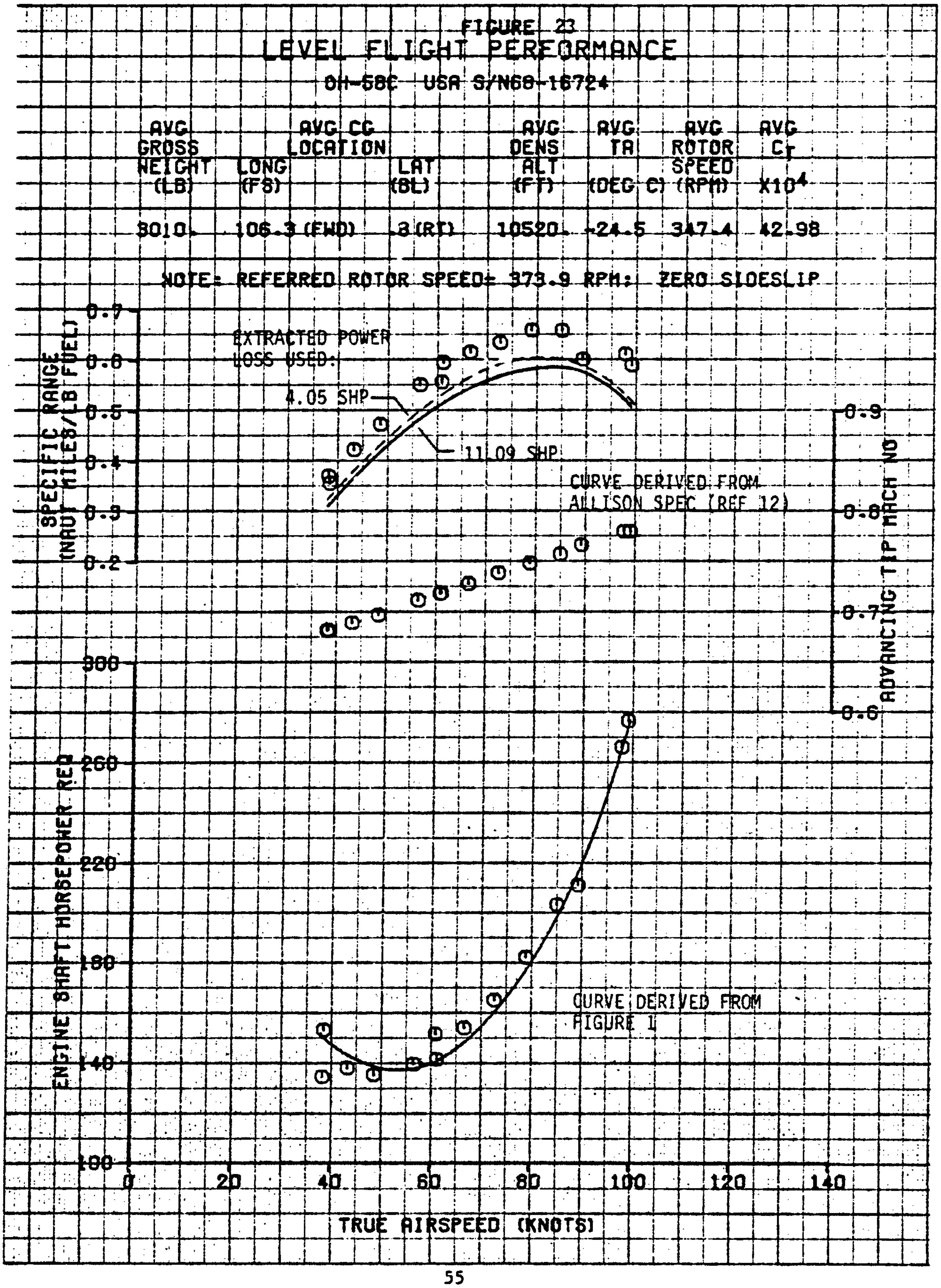


FIGURE 23
LEVEL FLIGHT PERFORMANCE
OH-58C USA S/N68-16724
AVG GROSS WEIGHT (LB)
AVG CG LOCATION
LONG (FS)
LAT (BL)
AVG DENS ALT (FT)
AVG TA (DEG C)
AVG ROTOR SPEED (RPM)
AVG CT X10⁴
3010
106.3 (FWD)
.3 (RT)
10520
-24.5
347.4
42.98
NOTE: REFERRED ROTOR SPEED= 373.9 RPM: ZERO SIDESLIP
EXTRACTED POWER LOSS USED:
4.05 SHP
11.09 SHP
CURVE DERIVED FROM ALLISON SPEC (REF 12)
SPECIFIC RANGE (NAUT MILES/LB FUEL)
0.7
0.6
0.5
0.4
0.3
0.2
ADVANCING TIP MACH NO
0.9
0.8
0.7
0.6
ENGINE SHAFT HORSEPOWER REQ
300
260
220
180
140
100
CURVE DERIVED FROM FIGURE 1
0
20
40
60
80
100
120
140
TRUE AIRSPEED (KNOTS)

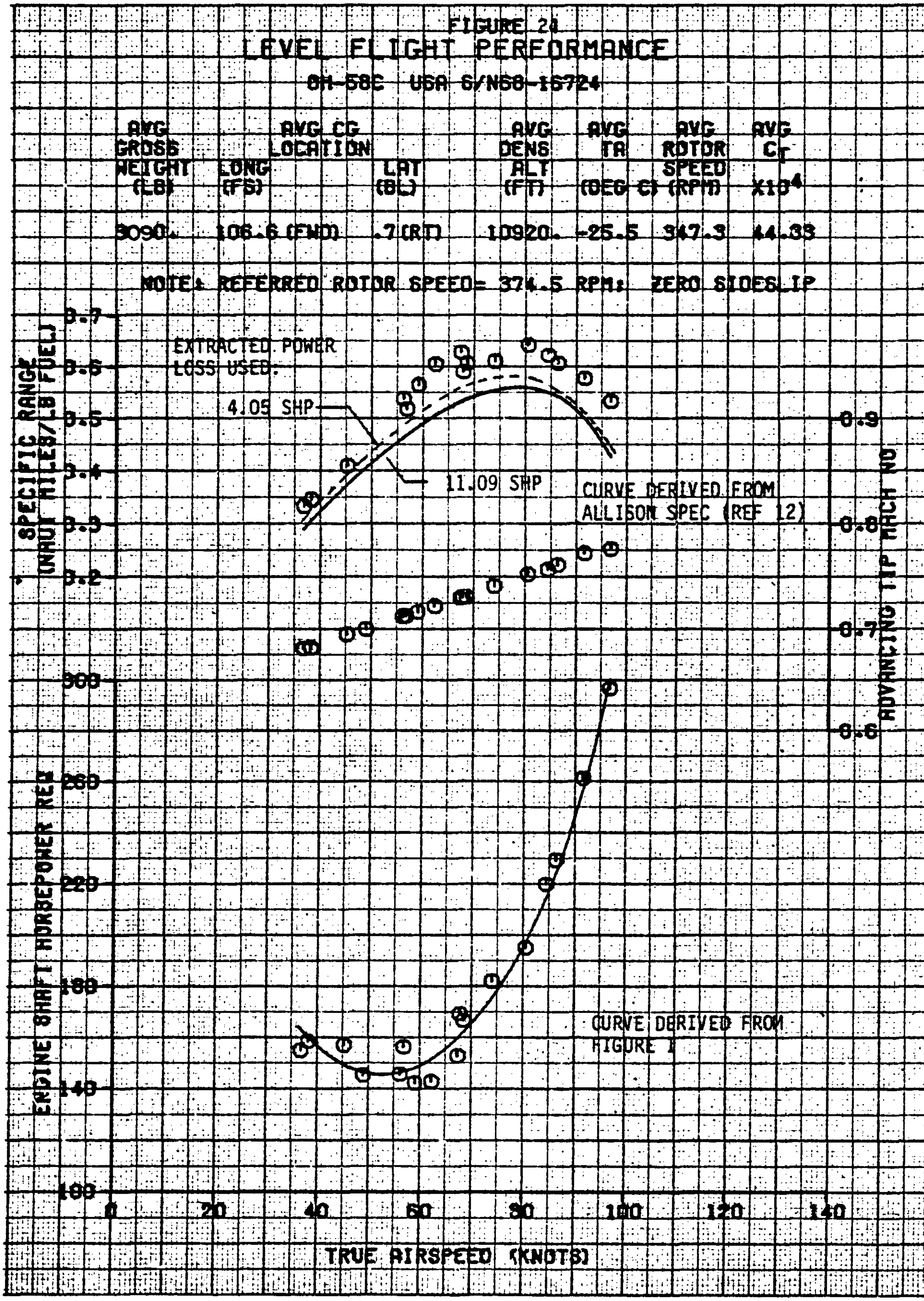


FIGURE 24
LEVEL FLIGHT PERFORMANCE
OH-58C USA S/N68-16724
AVG GROSS WEIGHT (LB)
AVG CG LOCATION
LONG (FS)
LAT (BL)
AVG DENS ALT (FT)
AVG TA (DEG C)
AVG ROTOR SPEED (RPM)
AVG CT X10^4
3090.
106.6 (FWD)
.7 (RT)
10920.
-25.5
347.3
44.33
NOTE: REFERRED ROTOR SPEED= 374.5 RPM; ZERO SIDESLIP
EXTRACTED POWER LOSS USED:
4.05 SHP
11.09 SHP
CURVE DERIVED FROM ALLISON SPEC (REF 12)
CURVE DERIVED FROM FIGURE I
SPECIFIC RANGE (NAUT MILES/LB FUEL)
ENGINE SHAFT HORSEPOWER REQ
ADVANCING TIP MACH NO
TRUE AIRSPEED (KNOTS)
0.7
0.6
0.5
0.4
0.3
0.2
300
260
220
180
140
100
0.9
0.8
0.7
0.6
0
20
40
60
80
100
120
140

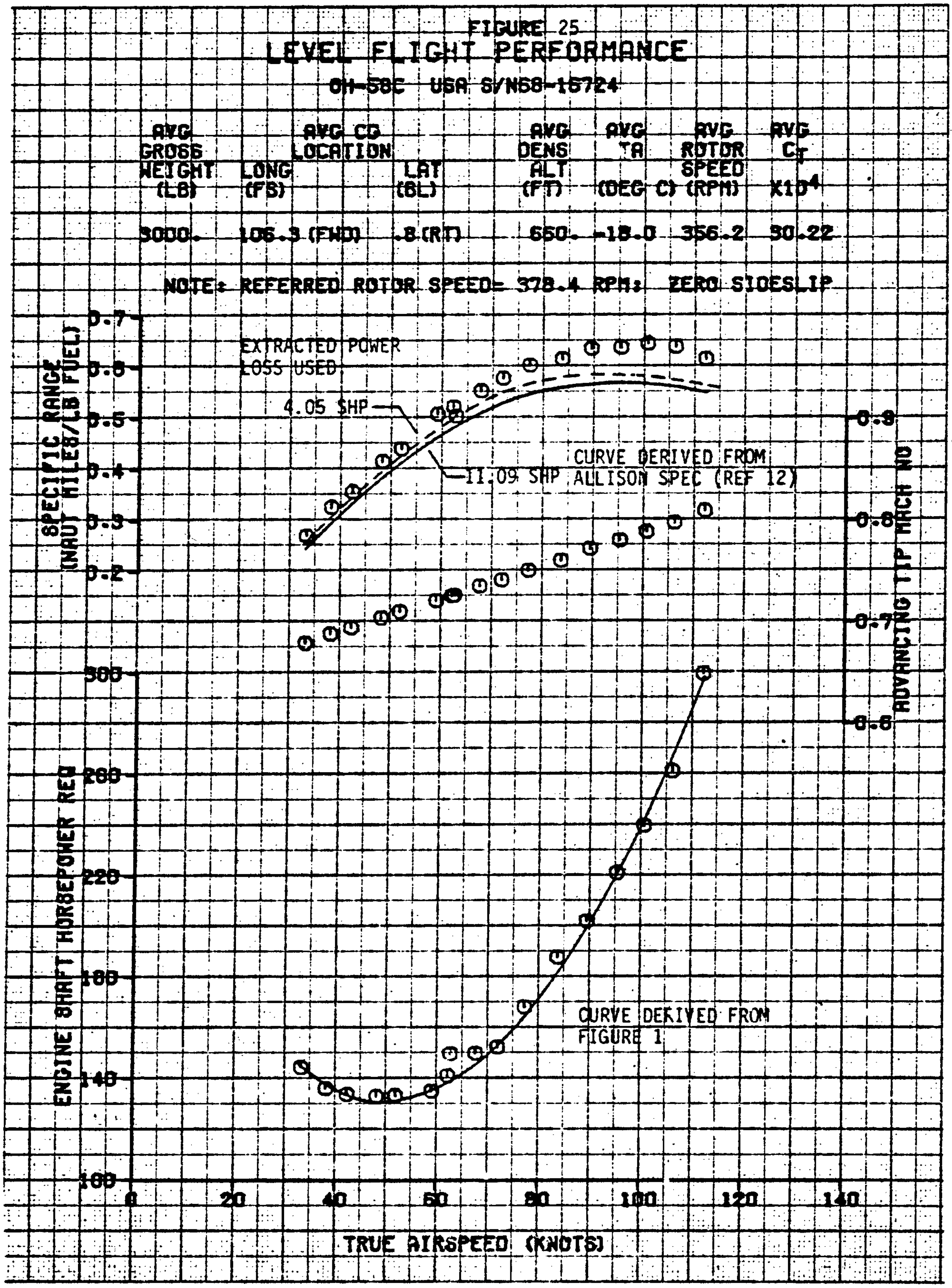
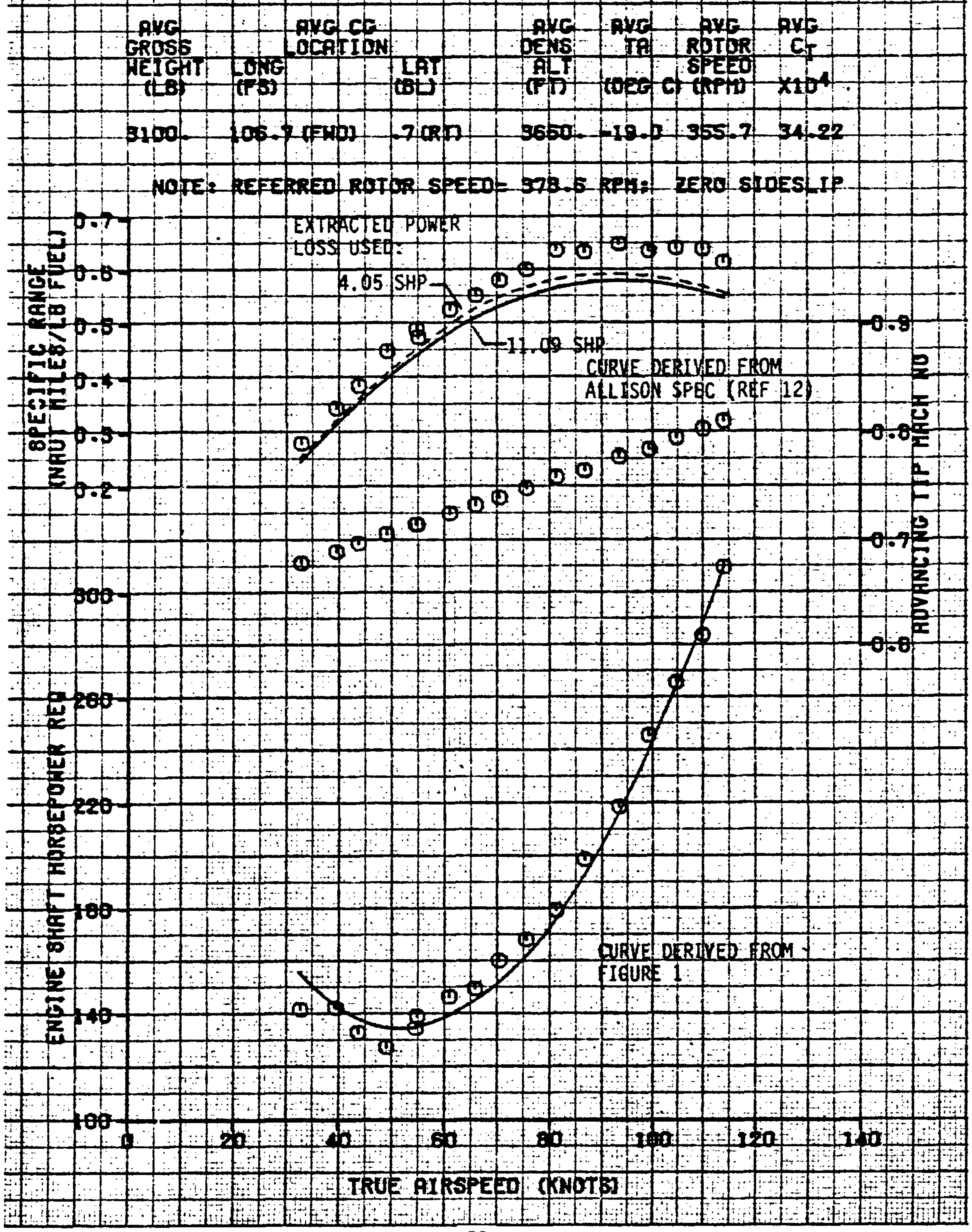


FIGURE 25
LEVEL FLIGHT PERFORMANCE

FIGURE 26
LEVEL FLIGHT PERFORMANCE
OH-58C USA S/N68-16724



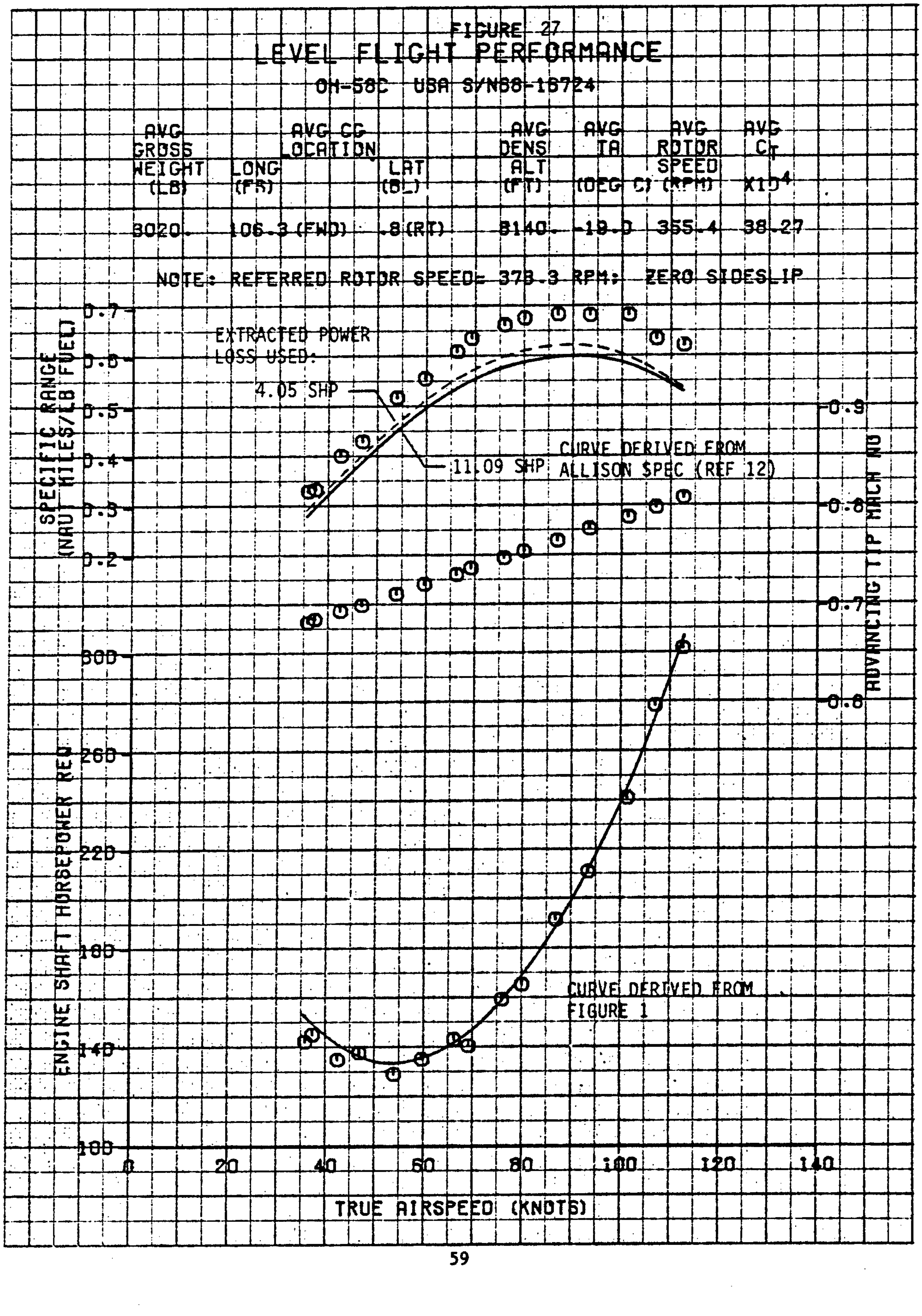


FIGURE 27
LEVEL FLIGHT PERFORMANCE
OH-58C USA S/N68-16724
AVG GROSS WEIGHT (LB)
AVG CG LOCATION
LONG (FS)
LAT (BL)
AVG DENS ALT (FT)
AVG TA (DEG C)
AVG ROTOR SPEED (RPM)
AVG CT X10^4
3020. 106.3 (FWD) .8 (RT) 8140. -19.0 355.4 38.27
NOTE: REFERRED ROTOR SPEED= 378.3 RPM; ZERO SIDESLIP
EXTRACTED POWER LOSS USED:
4.05 SHP
11.09 SHP
CURVE DERIVED FROM ALLISON SPEC (REF 12)
CURVE DERIVED FROM FIGURE 1
SPECIFIC RANGE (NAUT MILES/LB FUEL)
ENGINE SHAFT HORSEPOWER REQ
ADVANCING TIP MACH NO
TRUE AIRSPEED (KNOTS)

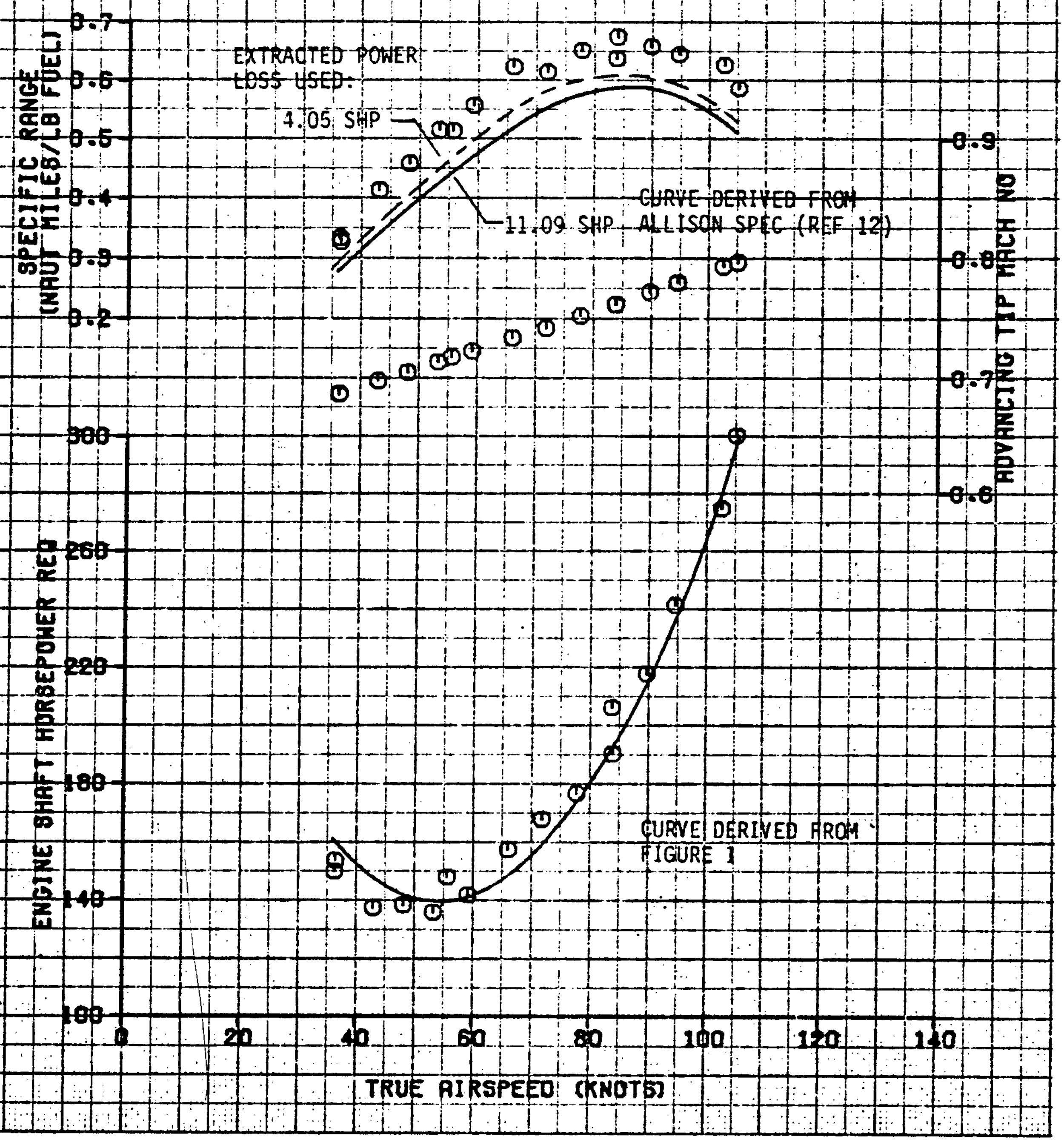
FIGURE 28

LEVEL FLIGHT PERFORMANCE

OH-58C USA S/N68-16724

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG DENS ALT (FT)	AVG TA (DEG C)	AVG ROTOR SPEED (RPM)	AVG C_T $X10^4$
3100.	106.6 (FWD)	.7 (RT)	8500.	-20.5	354.5	41.20

NOTE: REFERRED ROTOR SPEED= 378.7 RPM: ZERO SIDESLIP



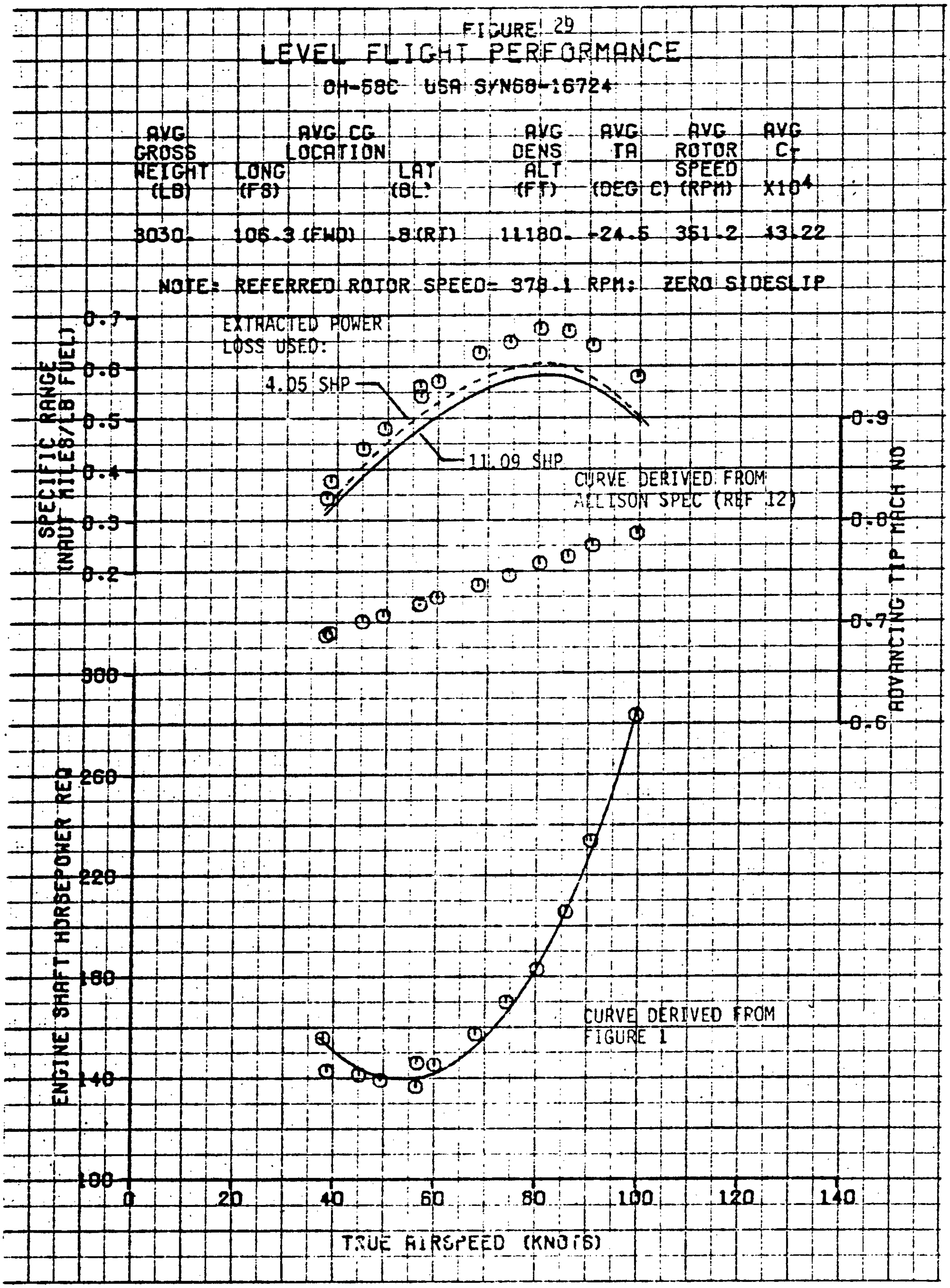
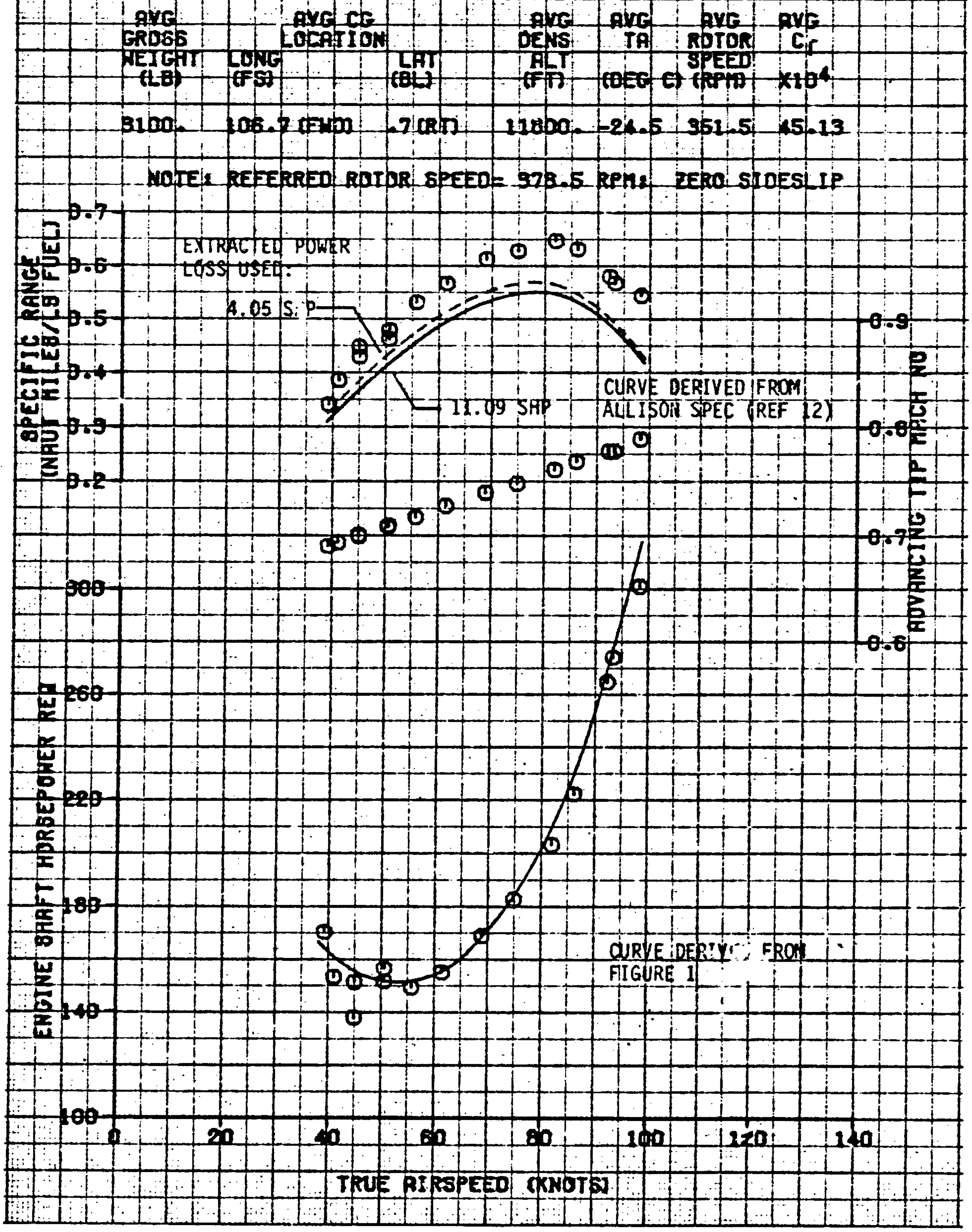


FIGURE 29
LEVEL FLIGHT PERFORMANCE
OH-58C USA S/N68-16724
AVG GROSS WEIGHT (LB)
AVG CG LOCATION
LONG (FS)
LAT (BL)
AVG DENS ALT (FT)
AVG TA (DEG C)
AVG ROTOR SPEED (RPM)
AVG C_T $X10^4$
3030. 106.3 (FWD) .8 (RT) 11180. -24.5 351.2 43.22
NOTE: REFERRED ROTOR SPEED= 378.1 RPM: ZERO SIDESLIP
EXTRACTED POWER LOSS USED:
4.05 SHP
11.09 SHP
CURVE DERIVED FROM ALLISON SPEC (REF 12)
CURVE DERIVED FROM FIGURE 1
SPECIFIC RANGE (NAUT MILES/LB FUEL)
ENGINE SHAFT HORSEPOWER REQ
ADVANCING TIP MACH NO
TRUE AIRSPEED (KNOTS)
0.2
0.3
0.4
0.5
0.6
0.7
100
140
180
220
260
300
0.6
0.7
0.8
0.9
0
20
40
60
80
100
120
140

FIGURE 30
LEVEL FLIGHT PERFORMANCE
OH-58C USA S/N68-16724



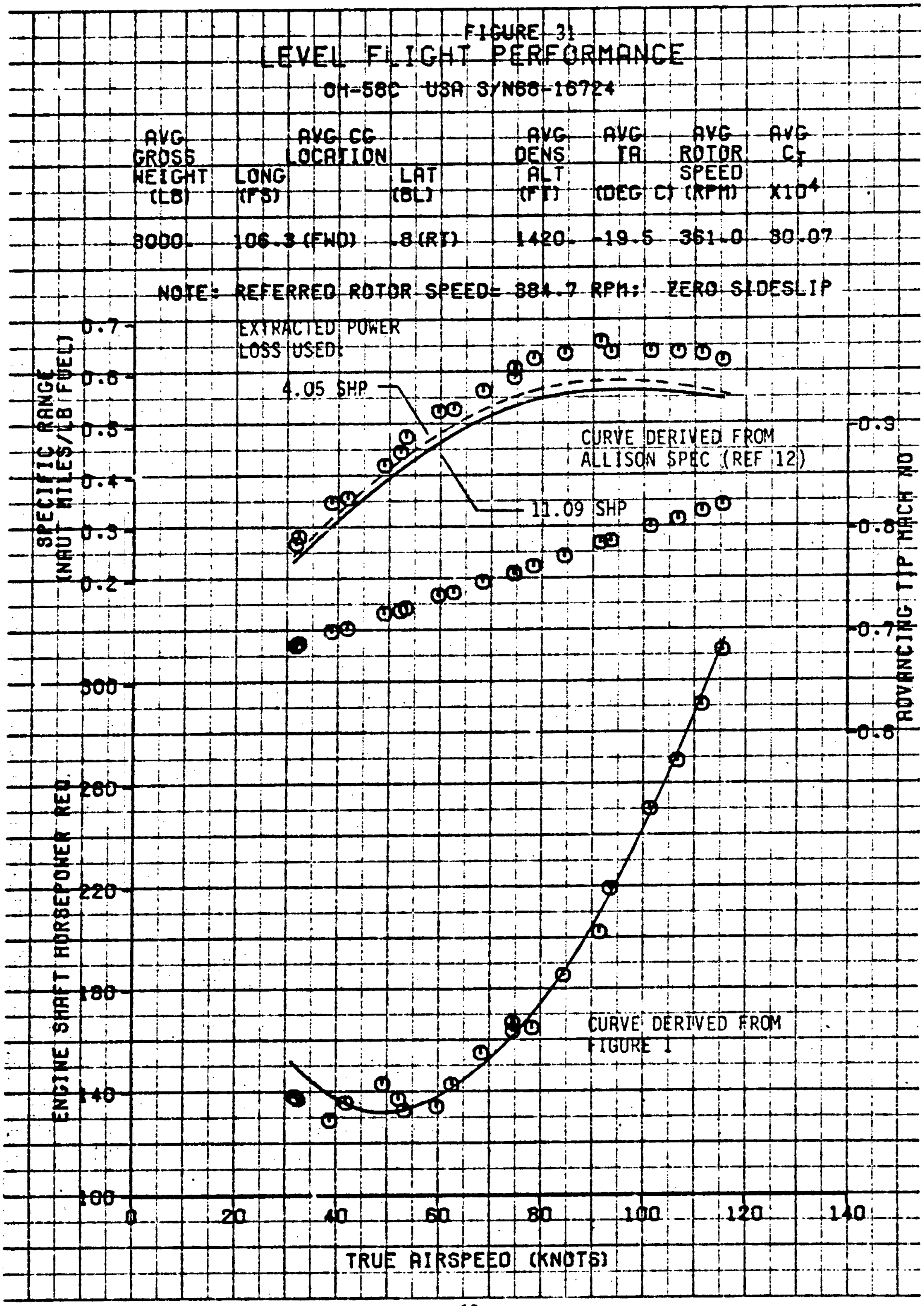


FIGURE 31
LEVEL FLIGHT PERFORMANCE
OH-58C USA S/N68-16724
AVG GROSS WEIGHT (LB)
AVG CG LOCATION
LONG (FS)
LAT (BL)
AVG DENS ALT (FT)
AVG TA (DEG C)
AVG ROTOR SPEED (RPM)
AVG C_T X10^4
3000 106.3 (FWD) .8 (RT) 1420 -19.5 361.0 30.07
NOTE: REFERRED ROTOR SPEED= 384.7 RPM; ZERO SIDESLIP
EXTRACTED POWER LOSS USED:
4.05 SHP
11.09 SHP
CURVE DERIVED FROM ALLISON SPEC (REF 12)
CURVE DERIVED FROM FIGURE 1
SPECIFIC RANGE (NAUT MILES/LB FUEL)
ENGINE SHAFT HORSEPOWER REQ
ADVANCING TIP MACH NO
TRUE AIRSPEED (KNOTS)
0.7
0.6
0.5
0.4
0.3
0.2
300
260
220
180
140
100
0.9
0.8
0.7
0.6
0
20
40
60
80
100
120
140

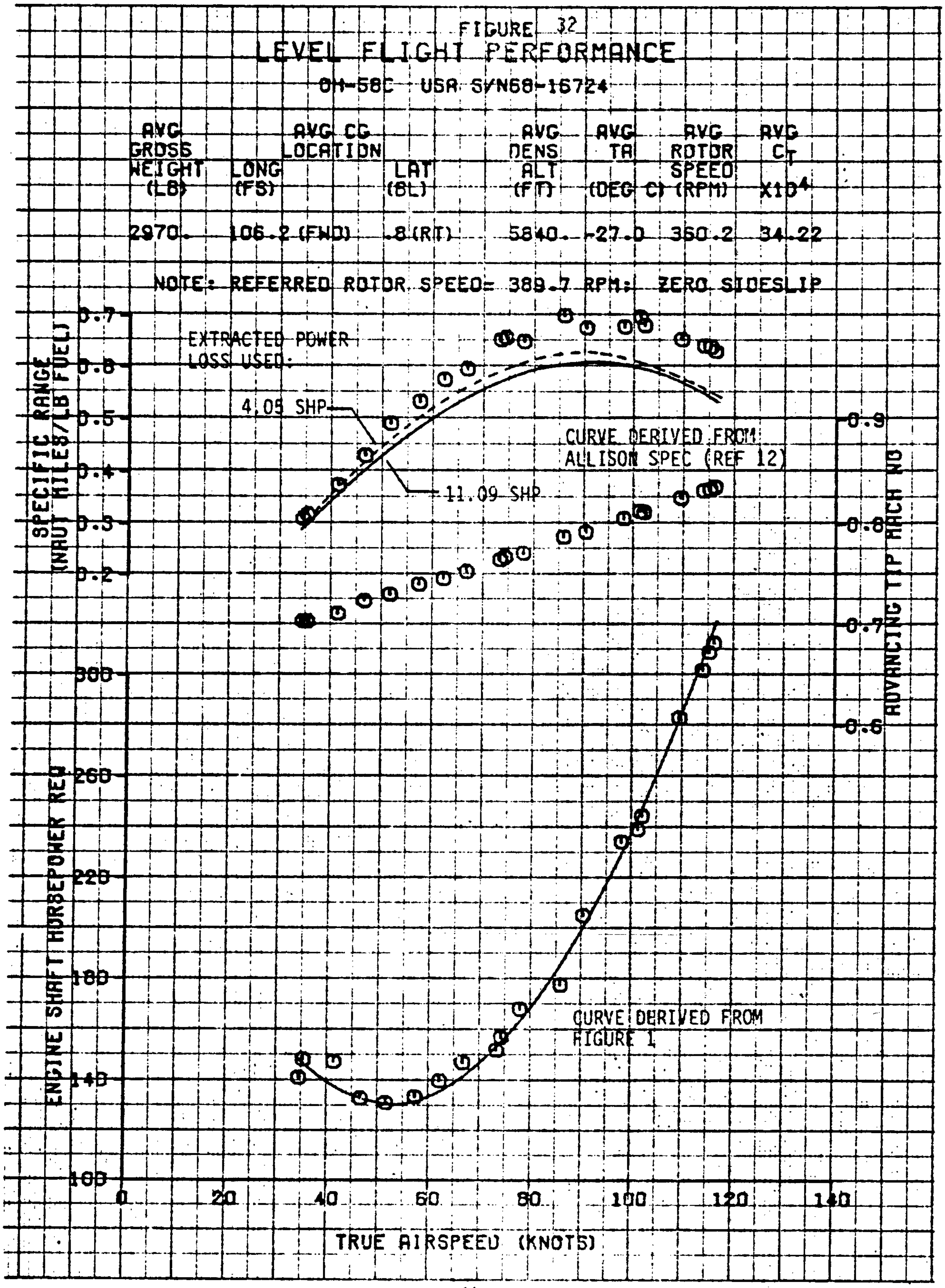


FIGURE 32
LEVEL FLIGHT PERFORMANCE
OH-58C USA S/N68-16724
AVG GROSS WEIGHT (LB)
AVG CG LOCATION
LONG (FS)
LAT (BL)
AVG DENS ALT (FT)
AVG TA (DEG C)
AVG ROTOR SPEED (RPM)
AVG CT X10^4
2970.
106.2 (FWD)
.8 (RT)
5840.
-27.0
350.2
34.22
NOTE: REFERRED ROTOR SPEED= 389.7 RPM; ZERO SIDESLIP
EXTRACTED POWER LOSS USED:
4.05 SHP
11.09 SHP
CURVE DERIVED FROM ALLISON SPEC (REF 12)
CURVE DERIVED FROM FIGURE 1
SPECIFIC RANGE (NAUT MILES/LB FUEL)
ENGINE SHAFT HORSEPOWER REQ
ADVANCING TIP MACH NO
TRUE AIRSPEED (KNOTS)
0.7
0.6
0.5
0.4
0.3
0.2
300
260
220
180
140
100
0.9
0.8
0.7
0.6
0
20
40
60
80
100
120
140

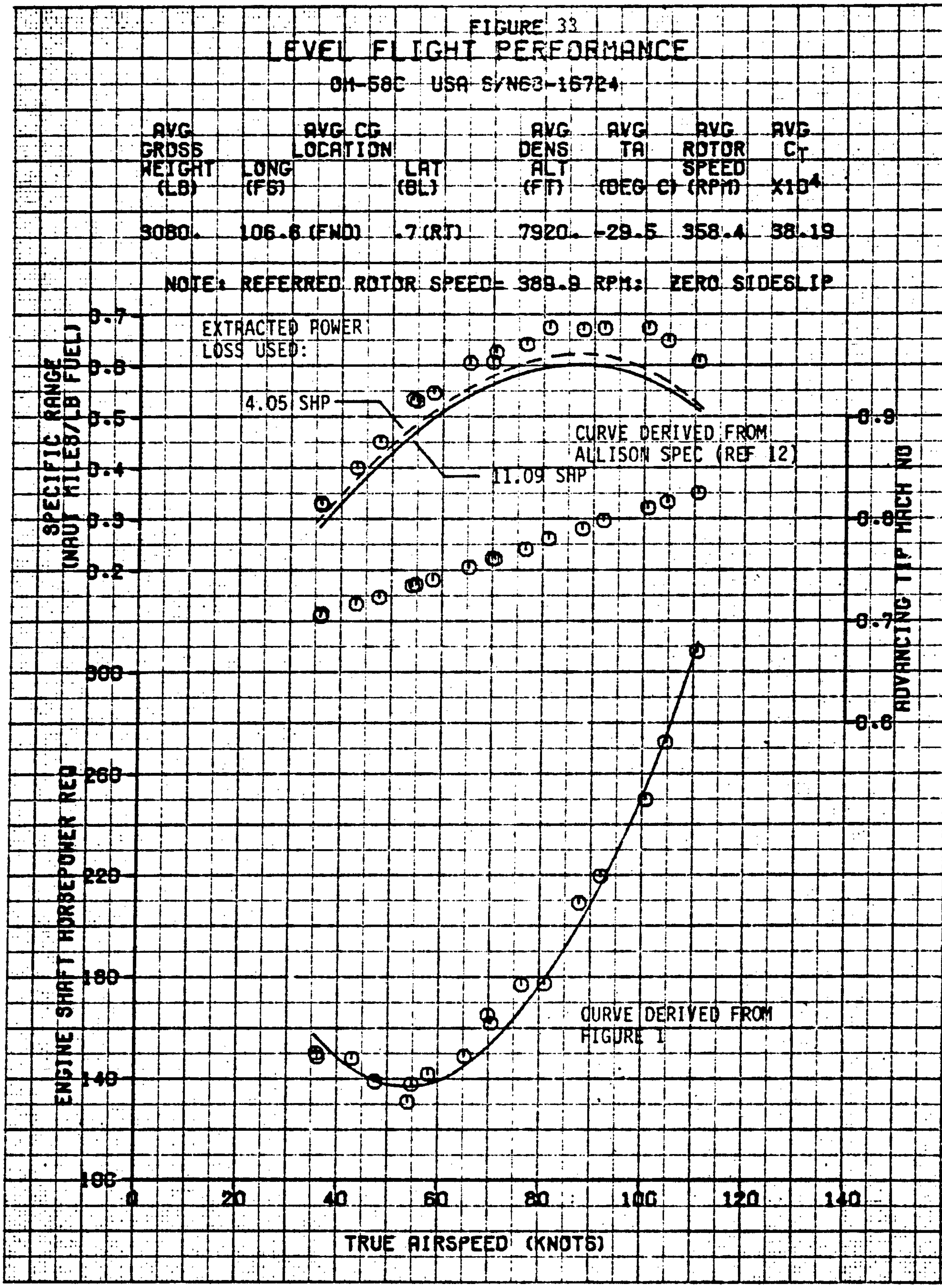
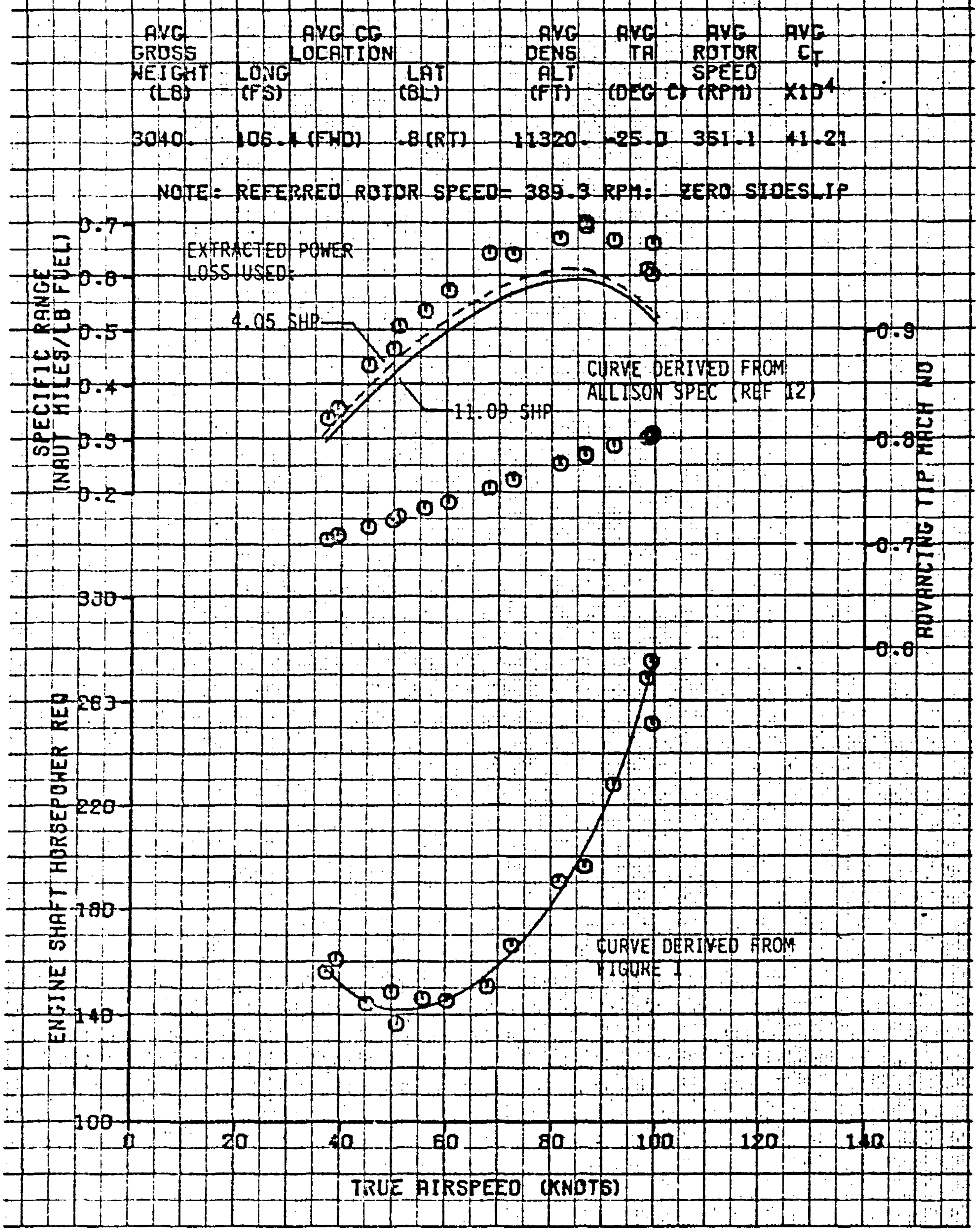


FIGURE 33
LEVEL FLIGHT PERFORMANCE
OH-58C USA S/N68-16724
AVG GROSS WEIGHT (LB)
AVG CG LOCATION
LONG (FS)
LAT (BL)
AVG DENS ALT (FT)
AVG TA (DEG C)
AVG ROTOR SPEED (RPM)
AVG C_T X10[4]
3080. 106.8 (FWD) .7 (RT) 7920. -29.5 358.4 38.19
NOTE: REFERRED ROTOR SPEED= 389.9 RPM: ZERO SIDESLIP
EXTRACTED POWER LOSS USED:
4.05 SHP
11.09 SHP
CURVE DERIVED FROM ALLISON SPEC (REF 12)
CURVE DERIVED FROM FIGURE I
SPECIFIC RANGE (NAUT MILES/LB FUEL)
ENGINE SHAFT HORSEPOWER REQ
ADVANCING TIP MACH NO
TRUE AIRSPEED (KNOTS)

FIGURE 34
LEVEL FLIGHT PERFORMANCE
OH-58C USA S/N68-16724



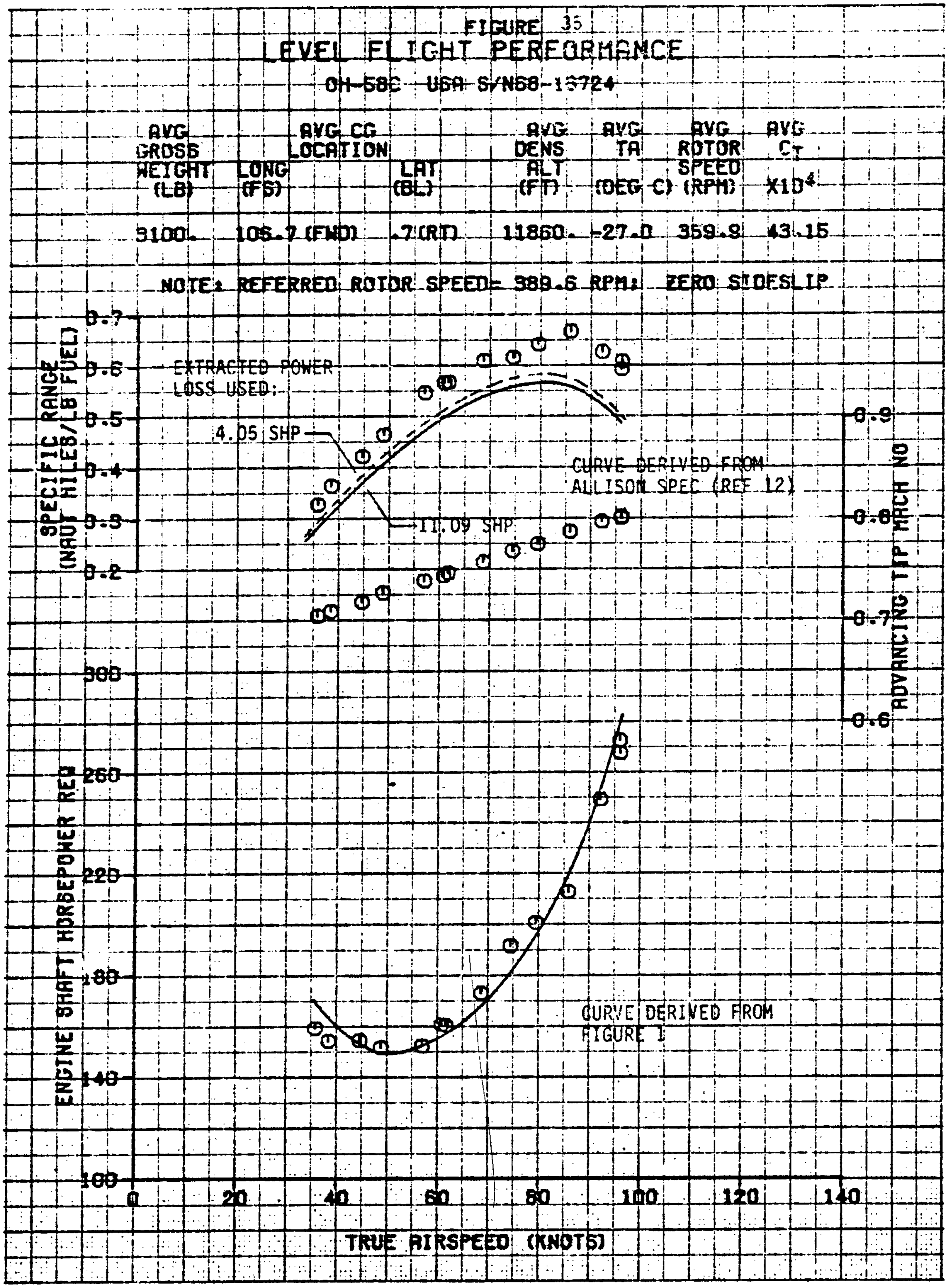


FIGURE 35
LEVEL FLIGHT PERFORMANCE
OH-58C USA S/N68-16724
AVG GROSS WEIGHT (LB)
AVG CG LOCATION
LONG (FS)
LAT (BL)
AVG DENS ALT (FT)
AVG TA (DEG C)
AVG ROTOR SPEED (RPM)
AVG C_T X10⁴
3100. 106.7 (FWD) .7 (RT) 11860. -27.0 359.9 43.15
NOTE: REFERRED ROTOR SPEED= 389.6 RPM: ZERO SIDESLIP
EXTRACTED POWER LOSS USED:
4.05 SHP
11.09 SHP
CURVE DERIVED FROM ALLISON SPEC (REF 12)
CURVE DERIVED FROM FIGURE 1
SPECIFIC RANGE (NAUT MILES/LB FUEL)
ADVANCING TIP MACH NO
ENGINE SHAFT HORSEPOWER REQ
TRUE AIRSPEED (KNOTS)

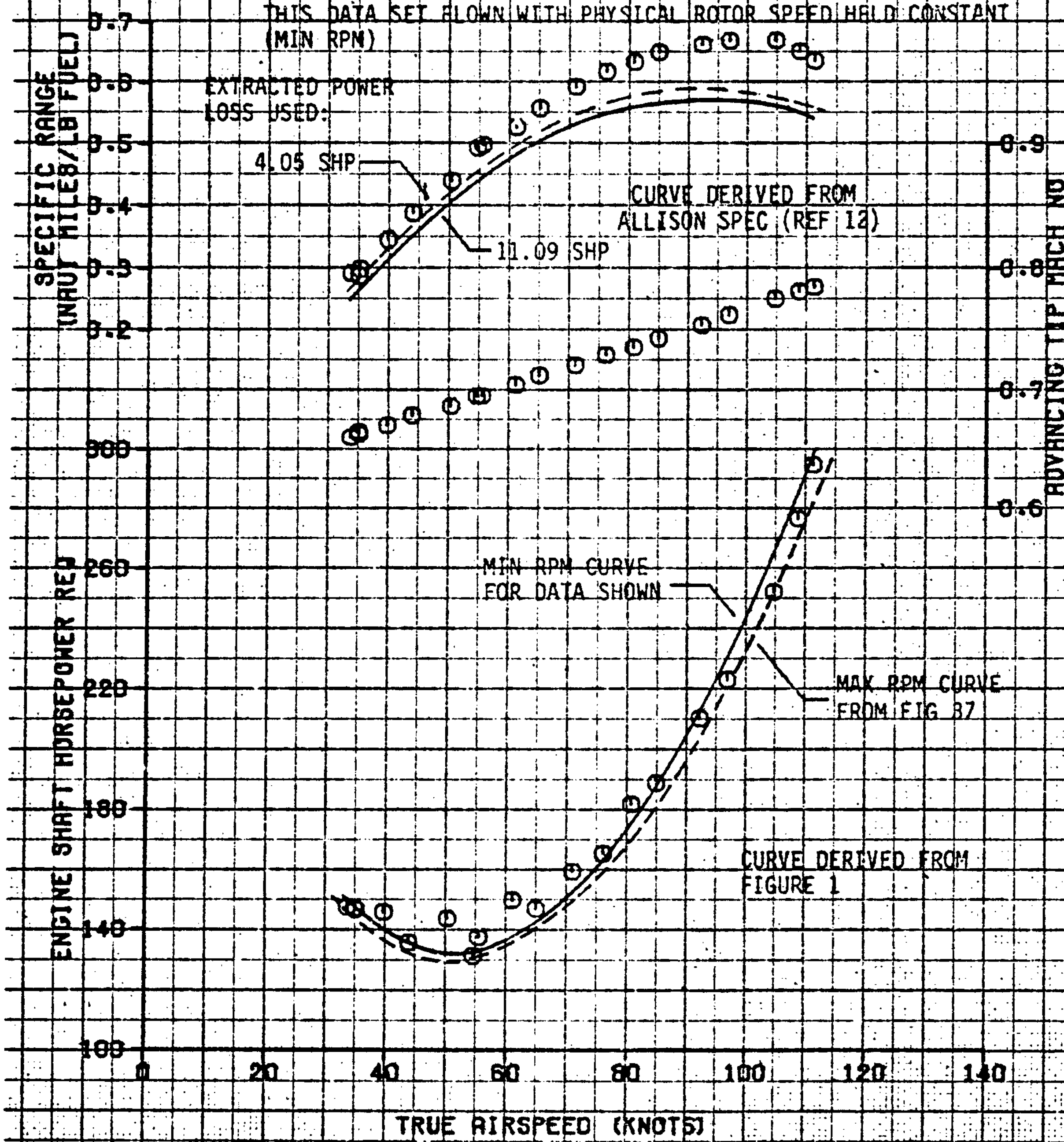
FIGURE 36

LEVEL FLIGHT PERFORMANCE

OH-58C USA S/N68-16724

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	LAT (BL)	AVG DENS ALT (FT)	AVG TA (DEG C)	AVG ROTOR SPEED (RPM)	AVG C_T $X10^4$
3110.	106.7 (FWD)	.7 (RT)	2980.	-15.0	346.2	35.57

NOTE: REFERRED ROTOR SPEED= 366.4 RPM: ZERO SIDESLIP
THIS DATA SET FLOWN WITH PHYSICAL ROTOR SPEED HELD CONSTANT (MIN RPM)



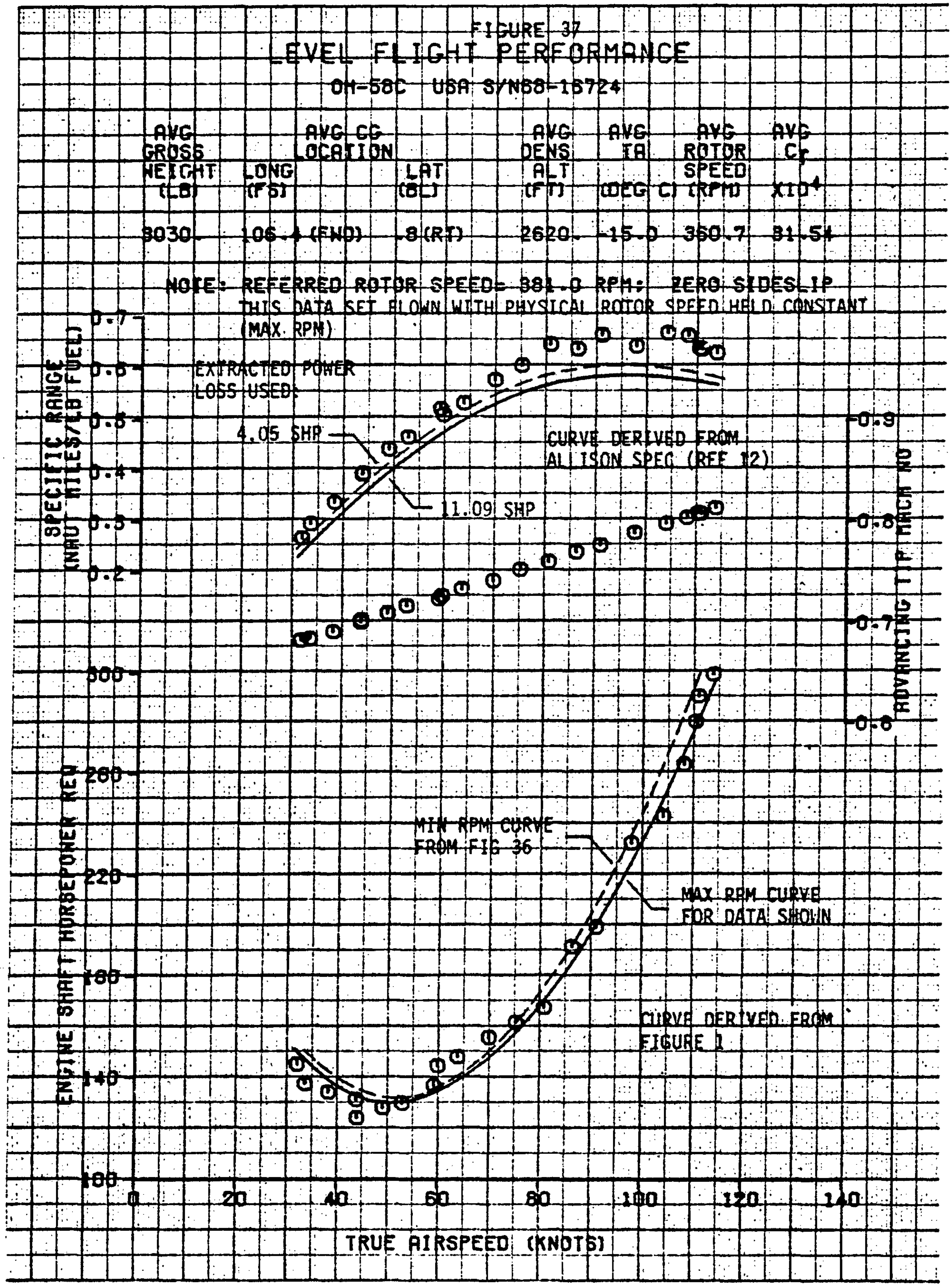


FIGURE 37
LEVEL FLIGHT PERFORMANCE
OH-58C USA S/N68-16724
AVG GROSS WEIGHT (LB)
AVG CG LOCATION
LONG (FS)
LAT (BL)
AVG DENS ALT (FT)
AVG TA (DEG C)
AVG ROTOR SPEED (RPM)
AVG C_T $X10^4$
3030
106.4 (FWD)
.8 (RT)
2620
-15.0
360.7
31.54
NOTE: REFERRED ROTOR SPEED= 381.0 RPM; ZERO SIDESLIP
THIS DATA SET FLOWN WITH PHYSICAL ROTOR SPEED HELD CONSTANT (MAX RPM)
EXTRACTED POWER LOSS USED:
4.05 SHP
11.09 SHP
CURVE DERIVED FROM ALLISON SPEC (REF 12)
SPECIFIC RANGE (NAUT MILES/LB FUEL)
ADVANCING TIP MACH NO
MIN RPM CURVE FROM FIG 36
MAX RPM CURVE FOR DATA SHOWN
CURVE DERIVED FROM FIGURE 1
ENGINE SHAFT HORSEPOWER REQ
TRUE AIRSPEED (KNOTS)

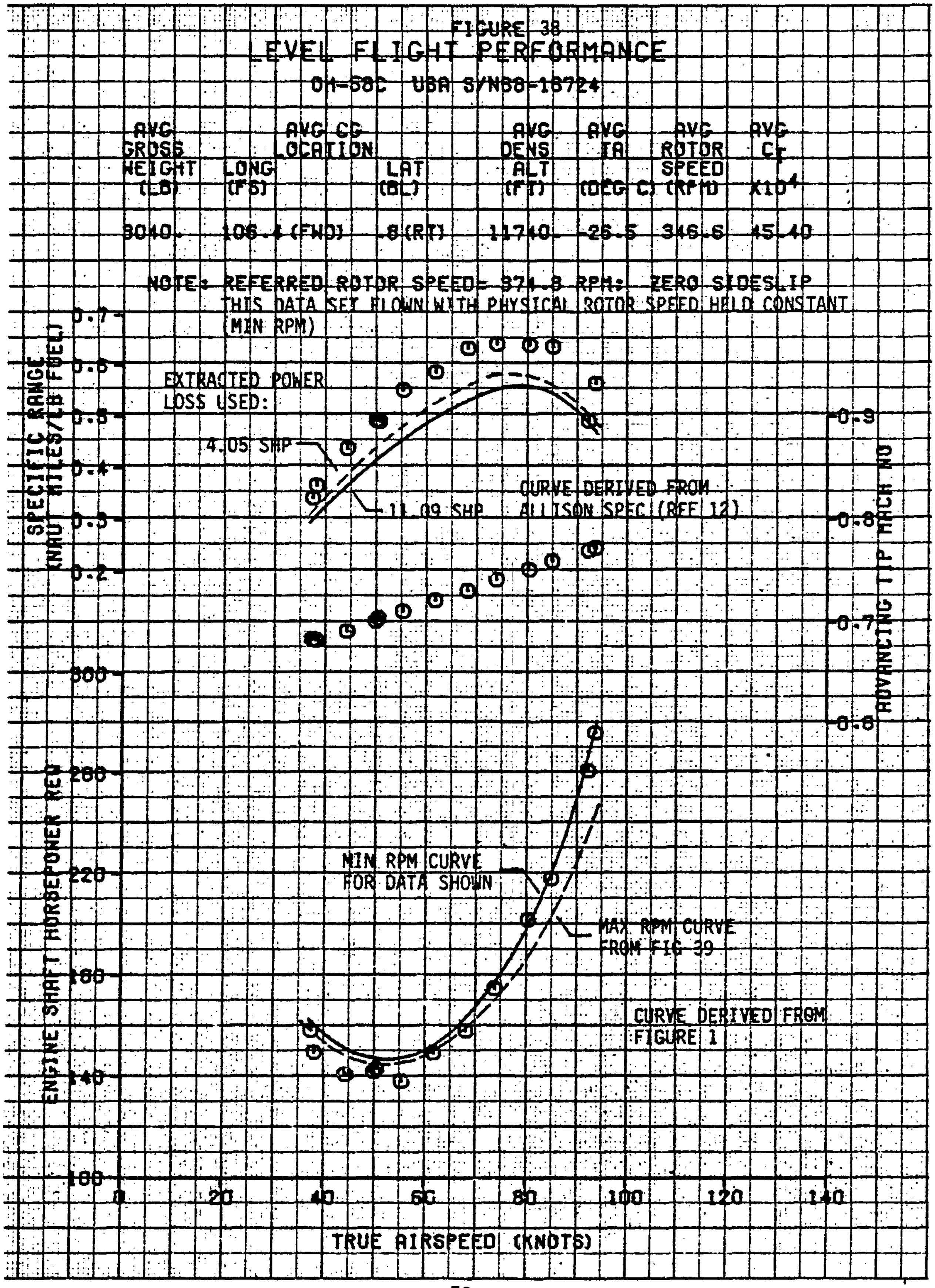


FIGURE 38
LEVEL FLIGHT PERFORMANCE
OH-58C USA S/N68-16724
AVG GROSS WEIGHT (LB)
AVG CG LOCATION
LONG (FS)
LAT (BL)
AVG DENS ALT (FT)
AVG OAT (DEG C)
AVG ROTOR SPEED (RPM)
AVG CT X10^4
3040.
106.4 (FWD)
.8 (RT)
11740.
-26.5
346.6
45.40
NOTE: REFERRED ROTOR SPEED= 374.8 RPM: ZERO SIDESLIP
THIS DATA SET FLOWN WITH PHYSICAL ROTOR SPEED HELD CONSTANT (MIN RPM)
EXTRACTED POWER LOSS USED:
4.05 SHP
11.09 SHP
CURVE DERIVED FROM ALLISON SPEC (REF 12)
SPECIFIC RANGE (NAUT MILES/LB FUEL)
ADVANCING TIP MACH NO
MIN RPM CURVE FOR DATA SHOWN
MAX RPM CURVE FROM FIG 39
CURVE DERIVED FROM FIGURE 1
ENGINE SHAFT HORSEPOWER REQ
TRUE AIRSPEED (KNOTS)
0.2
0.3
0.4
0.5
0.6
0.7
0.6
0.7
0.8
0.9
100
140
180
220
260
300
0
20
40
60
80
100
120
140

FIGURE 39

LEVEL FLIGHT PERFORMANCE

OH-58C USA S/N68-16724

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG DENS ALT (FT)	AVG TA (DEG C)	AVG ROTOR SPEED (RPM)	AVG C_T $X10^4$
3110.	106.7 (FWD)	.7 (RT)	10680.	-27.5	361.5	41.22

NOTE: REFERRED ROTOR SPEED= 391.6 RPM; ZERO SIDESLIP
THIS DATA SET FLOWN WITH PHYSICAL ROTOR SPEED HELD CONSTANT (MAX RPM)

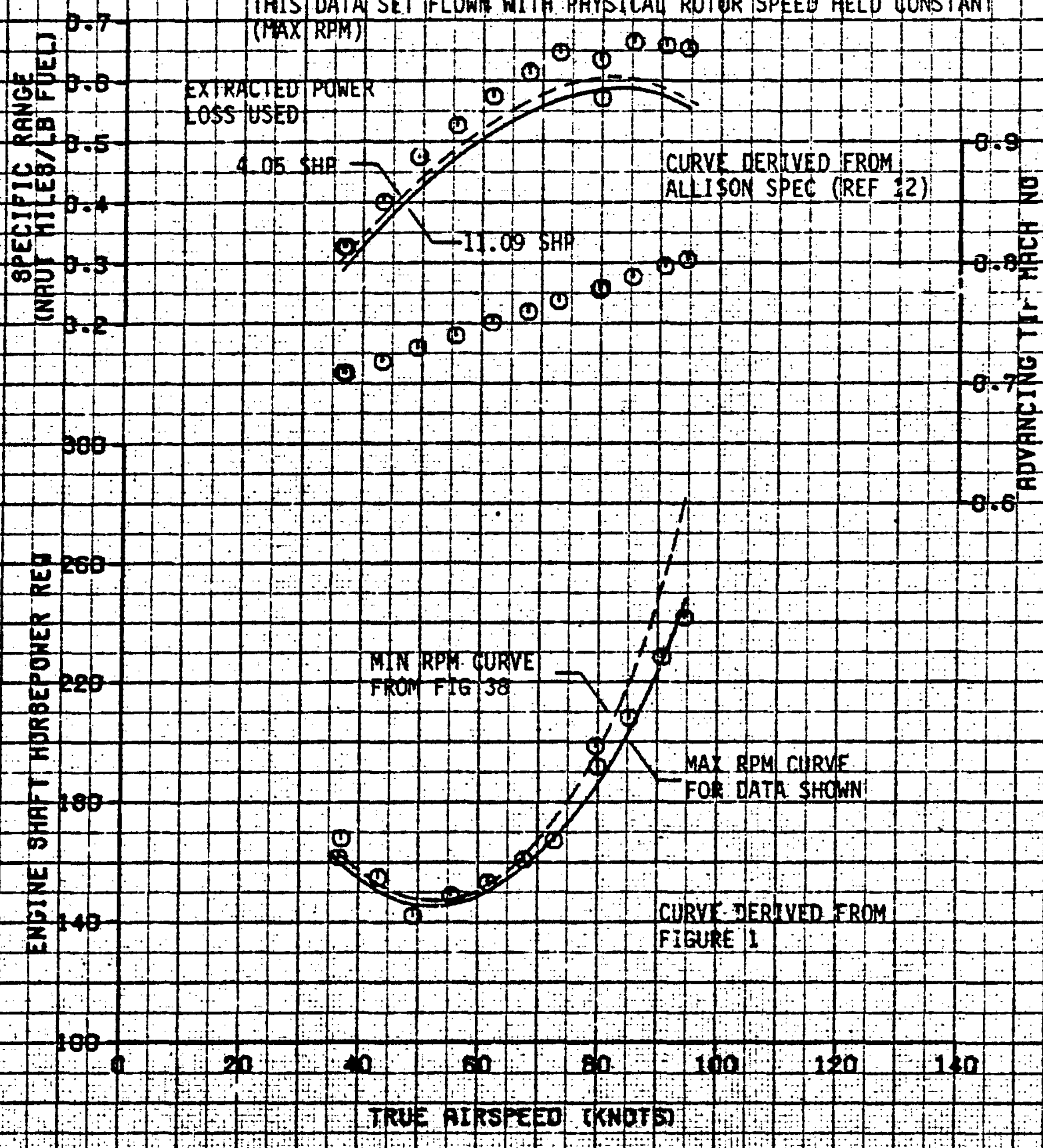


FIGURE 40
LEVEL FLIGHT PERFORMANCE
OH-58C USA S/N 68-16724

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	AVG CG LOCATION LAT (BL)	AVG DENSITY ALTITUDE (FT)	AVG TA (°C)	AVG ROTOR SPEED (RPM)	AVG C_T $x 10^4$
3020	107.1(FWD)	.9(RT)	6980	13.0	347.8	38.61

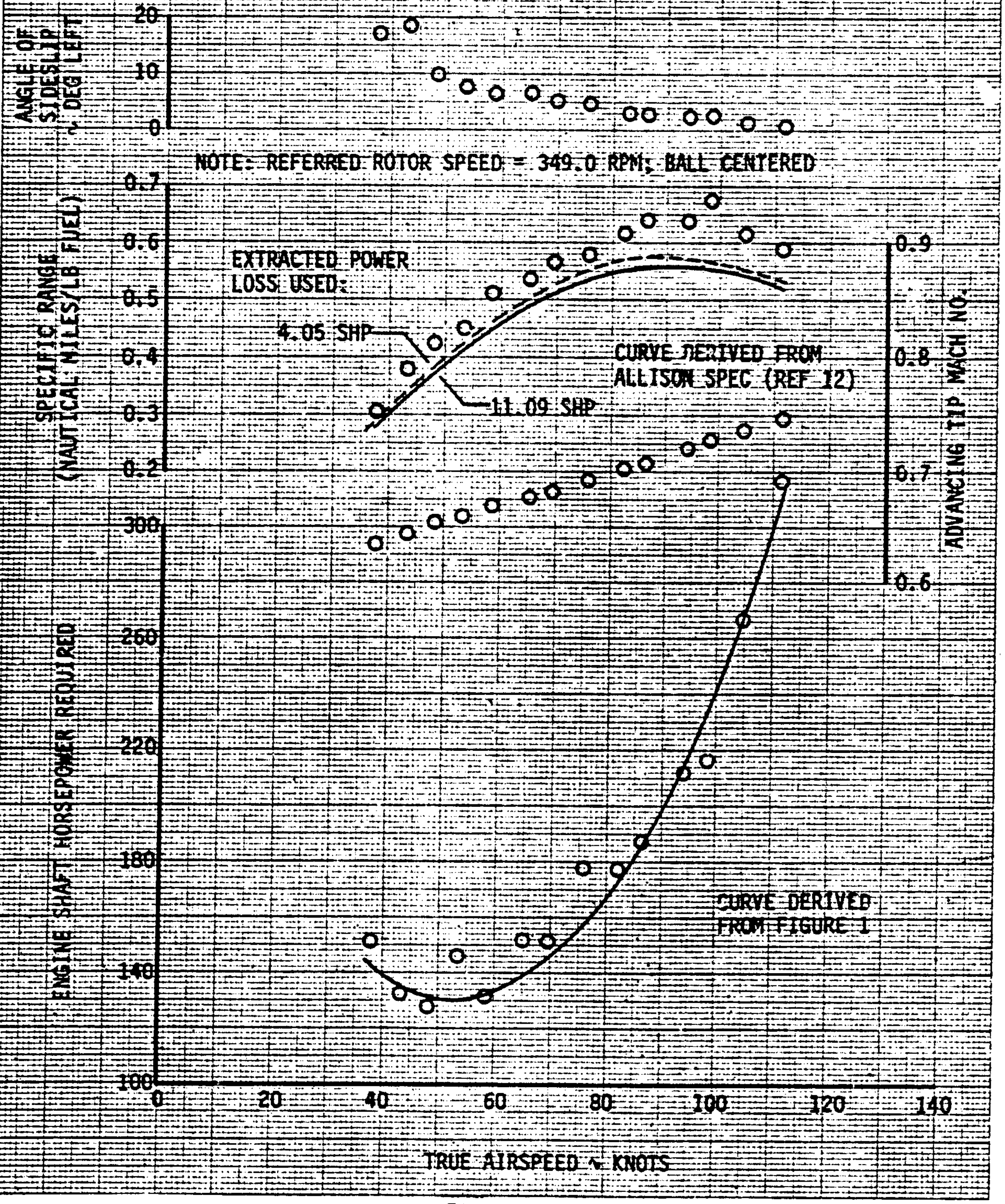


FIGURE 41
LEVEL FLIGHT PERFORMANCE
OH-58C USA S/N 68-16724

AVG GROSS WEIGHT (LB)	AVG CG LOCATION LONG (FS)	LAT (BL)	AVG DENSITY ALTITUDE (FT)	AVG TA (°C)	AVG ROTOR SPEED (RPM)	AVG C_T x 10^4
3020	107.1(FWD)	.9(RT)	7000	12.6	347.6	38.66

NOTE: REFERRED ROTOR SPEED = 349.1 RPM; ZERO SIDESLIP

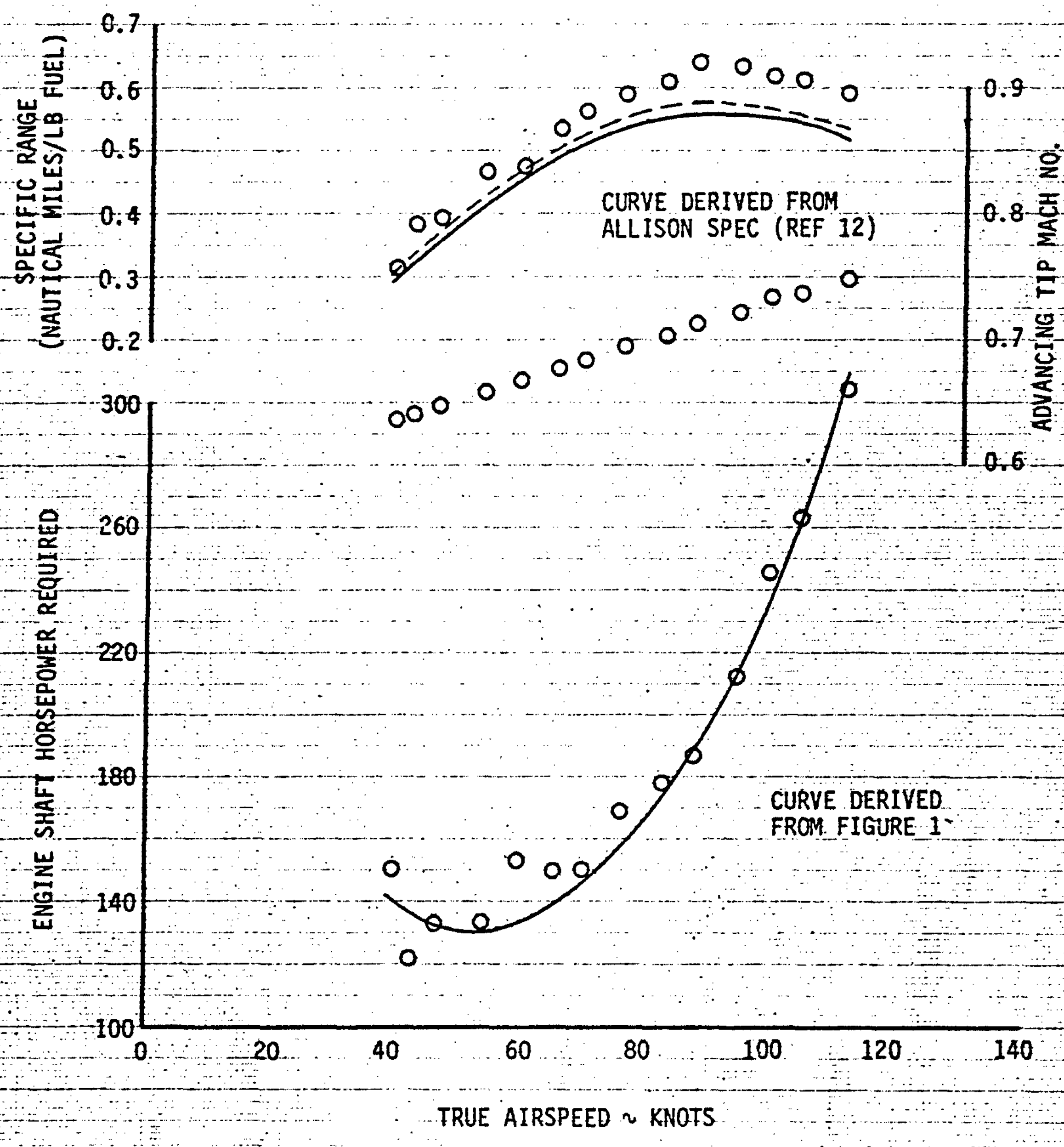
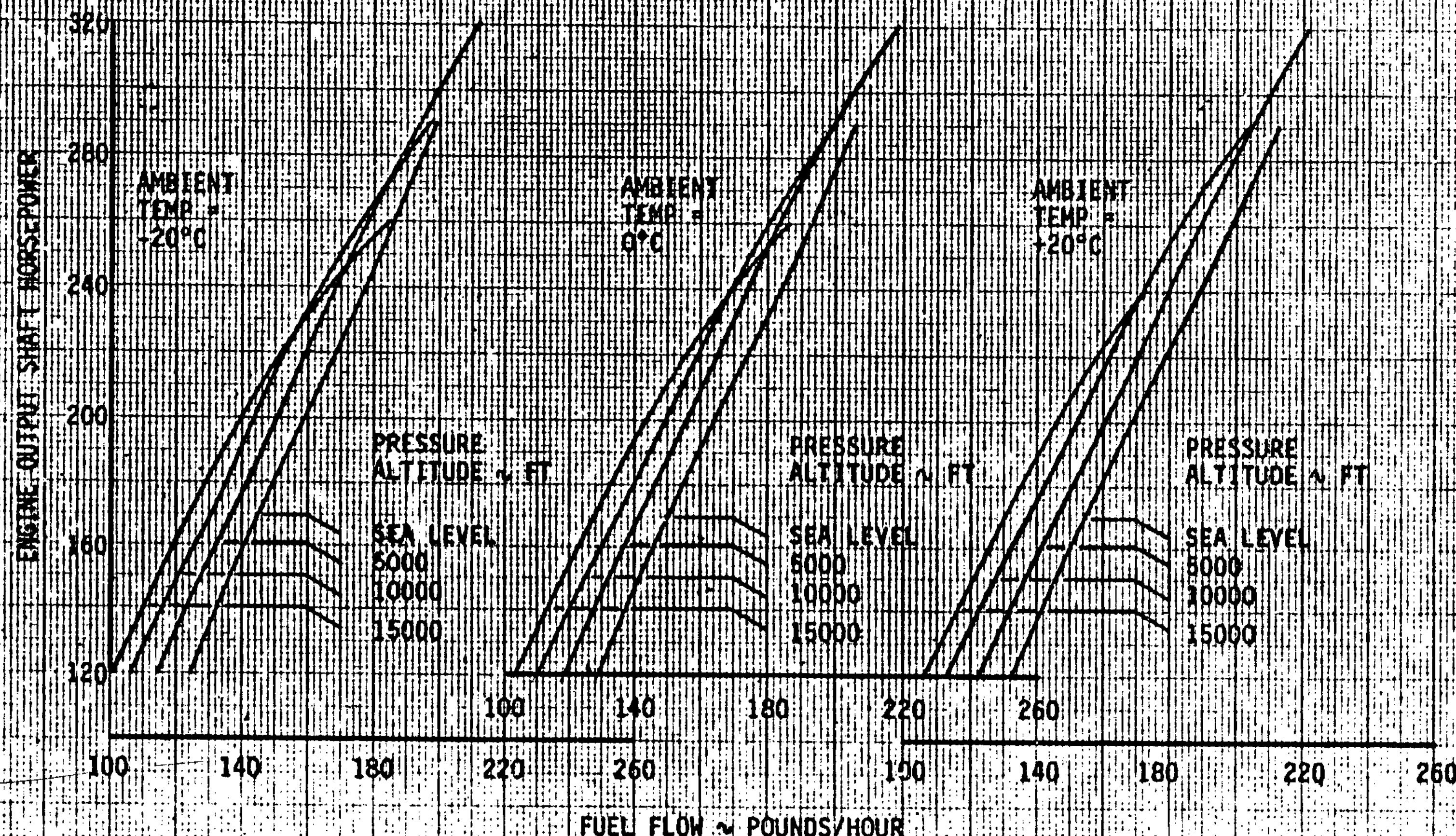


FIGURE 42
SPECIFICATION FUEL FLOW
ALLISON T63-A-720 ENGINE
POWER TURBINE SPEED = 34200 RPM

NOTE: CURVES DERIVED FROM ALLISON ENGINE SPECIFICATION MODEL T63-A-720 (REF 12, APP A)
1. AIRSPEED 80 KTAS
2. ZERO CUSTOMER BLEED AIR AND ANTI ICE OFF
3. INLET AND EXHAUST LOSSES FROM REF 7. 4.05 EXTRACTED SHP LOSS FROM DETAIL SPEC, REF 14



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